1969

H E A L T H T A S K F O R C E

REPORT OF

INCREASING KNOWLEDGE TASK FORCE

MAY 1, 1969

69.38

HEALTH TASK FORCE

Health Team on "Increasing Knowledge"

Report of May 1, 1969

TABLE OF CONTENTS

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

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: Chairman and Members
Health Task Force

DATE: May 1, 1969

: Chairman, "Increasing Knowledge" Health Team

: Chairman's Report

The Health Team assigned responsibility for contributing to the formulation of the FY 1971 Budget and the 1971-1975 Program and Financial Plan in the *Objective Area: Increasing Knowledge* was constituted late in the week of April 7. To the members nominated by the Office of the Assistant Secretary for Planning and Evaluation, other experts from government as well as from the private sector were added. Appendix I lists the full membership of the Team.

The first meeting of this Team was held on Monday, April 14th. After considerable discussion of the general problem, as well as the specific programs and issues assigned to the group, a consensus was reached that members of the staff of appropriate organizations be asked to develop outlines and then full-blown documents in each area of concern. Outlines of such documents were discussed at a subsequent meeting on Friday, April 18th, and full drafts on Friday, April 25th, Sunday, April 26th, and Monday, April 27th. Logistical considerations made it impossible to convene any substantial number of consultants from outside government until the 26th and 27th, except for Dr. Martin Cherkasky who participated in the meetings of April 18th and 25th. Many of the invited consultants had a conflicting commitment to participate in the activities of the Annual Meeting of the National Academy of Sciences scheduled for April 28, 29, and 30. While they could not thus participate in the group discussions of the Team, they were able to read the Reports and Issue Papers and provide comments to the staff on them in small group sessions. Dr. Milton Eisenhower was indisposed, but conveyed his views relevant to several of the issues implicitly or explicitly raised during a lengthy luncheon at his home with the Team Chairman. A summary of his views appear in Appendix II.

The documents were revised after these meetings. Taken in conjunction with this memorandum, they capture, in the view of the Team Chairman, the consensus of views which emerged during the exercise. However, since time did not permit circulation of the revised documents to the members, the Chairman hereby invites - and agrees to transmit to the Health Task Force - any dissents that members feel disposed to submit.

A number of important themes emerged during the discussions that cannot easily be incorporated into the documents prepared, but that will clearly be of interest to the Task Force.

HELP ELIMINATE WASTE HEW COST REDUCTION PROGRAM

Program Budgeting

The overwhelming majority of the Team felt that program budgeting was of highly limited use and marginal applicability to the forecasting of fiscal requirements in the area of Increasing Knowledge. Dr. John J. Burns stated that even in the biomedical research programs of Hoffmann-La Roche Inc., which by the standards of the NIH would have to be viewed as heavily "applied" and sharply "targeted" in character, only about 50% of expenditures could be categorized in "program" packages.

While everyone recognized the fact that a number of programmable elements could be identified in several of the research institutes and that the pursuit of these according to carefully designed and economically sound plans was yielding gratifying and important developments (e.g. improved effectiveness of the chemotherapy of the leukemia of childhood), this type of approach was not feasible for the majority of health problems because of an inadequate base of scientific knowledge. A coherent and directed assualt on the problem of "Aging" is as inconceivable at this time as the Manhattan project would have been before Einstein and Planck, or Project Apollo before Isaac Newton. The conventional wisdom of program budgeting which assumes specifiable "requirements" which can be coupled to predetermined goals or objectives is simply not valid for the majority of objectives of the research programs within the purview of this Team.

Alternatives to Program Budget

There was no major dissent from the view that in the area of biomedical research (in contrast to what might be called biomedical technology and technological development) budgeting must be "level of effort". The specific level of effort recommended in the future for the maintenance of a national system or network of research capability had to recognize the size and scope of the existing system and the need to protect it from abrupt and severe changes.

Other important considerations in pegging the level of effort should reflect the reality that:

- The stature of our national scientific effort is an important metric, in the eyes both of our people and of the world, of the quality of American society and the character of American civilization.

- The problems under attack, however intractable and impenetrable, are problems of life and death to millions of people.

- Research is, however paradoical the statement may appear, a service activity. Successful biomedical research leads to improved health care. Research investments can be regarded as investments in "product improvement".

Finally, the majority felt that the application of economic values epitomized by the use of (often spacious) cost/benefit or cost/effective calculations unmodulated by consideration of non-economic values was not a line of argument appropriate to the justification of a national commitment to increasing knowledge in the biomedical sciences. The consultants, especially Dr. Sinsheimer, were particularly articulate on this question.

The Emerging Strategy

There was a consensus that the cumulative impact of Federal decisions, particularly fiscal, over the last several years was clearly to terminate the growth and to initiate shrinkage in the national program of biomedical research. The evidential basis for this conclusion consisted in:

- Incrementation in research investments inadequate to meet inflationary cost increases.

- Reduction in absolute investments in research training with proportionately higher reductions in the numbers of research manpower in training.

- De facto withdrawal from responsibility to maintain and sustain, let alone expand, the health research facility "plant".

The team as a whole, with consultants perhaps more vocal than government representatives, felt that this emergent public policy should be isolated, spotlighted, and challenged. A magnificent research apparatus has been built since 1944 and since then has rendered extraordinarily important public service. Career opportunities with immense promise for the common good have been created where none existed in the past. Opportunities of potentially enormous beneficent impact on human health abound. Large numbers of highly talented young people can be recruited into the field and coupled into goals and objectives of great significance.

The members of the Team were unanimous in their conviction that the best interests of the nation demanded that the rate of growth of the national biomedical research endeavor be positive and accelerated.

The Scope of the Task

Throughout the deliberations of this Team, attention repeatedly focused on the central fact that the locus in which the overwhelming bulk of biomedical research was performed was the modern medical center. While recognizing the need for fragmenting the task at hand into meaningful segments such as those assigned this Team, considerable concern emerged about the problem of synthesizing a holistic and integrated view of the nation's medical schools, which also receive substantial amounts of Federal support for their educational and service programs. Clearly, severe damage will be done those institutions unless the Federal agencies

meet their requirements for support: for their programs to train health and allied health professionals, including teaching and library facilities; for their clinical service programs connected with essential teaching and demonstration activities; for their community service programs; and for their research programs. All Federal support objectives converge and are placed in proper balance and orderly array at the institutional level.

Some Special Problems of the Team

Program Definitions

After initial review by the Chairman and brief discussions with members of the Health Team, the Office of the Assistant Secretary for Planning and Evaluation responded affirmatively to a request to combine the program areas entitled "Training" and "Fellowships". The separation of Intramural from Extramural Research proved to be difficult because of the very large area of overlap and similarity between these two and because of the fairly large number of activities that have ambiguous properties no matter what criteria are used to distinguish extramural from intramural activities.

Research and Development Related to the Delivery of Health Care

Research and development related to the health care delivery systems did not formally fall within the purview of this Health Team. The members of the Team, however, wish to make a matter of record their view that this area was extremely important and worthy of substantial federal support.

The Self-Assessment of the Validity of Consultant Contribution and Recommendations

The consultants, almost to a man, disclaimed any special ability to discuss critically and in detail the desirable levels of funding. They recognized that the construction of a budget was a difficult task under the best of circumstances and one to be left to fiscal managers more experienced and familiar with the fine structure of the programs. Under these circumstances they felt that the role which they could play most effectively was to offer value judgments, based on experience within their own institutions as well as with other institutions about whose affairs they were familiar, on the general compatibility between the budgets proposed and the opportunities which they knew to exist.

Summary of Conclusions

The Team concluded that a large number of serious and unsolved health problems constituted a worthy challenge to the national system for health research that has been created largely as a result of federal initiative and federal funding since the end of World War II. The basic constraint upon the solution of these problems is lack of knowledge. Research holds a distinct promise to increase the knowledge base immediately and eventually to solve these problems. Accordingly, a plan is proposed which envisages balanced growth: in the operating expenses for research; in the facilities for the conduct of research; and in the development of the manpower

to continue to expand the research effort. Clearly to sustain the present level of effort requires replacement for personnel attrition and of facilities which become obsolete. Growth requires the training of additional manpower and the construction of additional facilities. Both of these require long lead times.

The forward plans in the area of extramural and intramural research, training, and facilities are, as best one can judge, consistent with each other and represent the requirements for holistic growth and circumvention of constraints. The rates of growth proposed (Appendix III) were viewed by the consultants as consistent with their views of the potential opportunities which existed in the private sector.

Thomas J. Kennedy, Jr.

Thomas J. Kennedy, Jr., M.D.
Associate Director for Program
Planning and Evaluation, NIH

Attachments:

Program Papers:

- National Library of Medicine
- Training and Fellowships
- Extramural Research
- Intramural Research
- Health Research Facilities Construction

Issue Papers:

- Salary Support for Medical School Faculty
- Stabilization of Medical Schools
- Advantages of Training Grants

Appendix I - Members of the Health Team on Increasing Knowledge
Appendix II - Letter to Dr. Milton Eisenhower
Appendix III - Summary Program and Financial Plan

APPENDIX I

HEALTH TEAM ON "INCREASING KNOWLEDGE"

Departmental Nominees:

Chairman: Thomas J. Kennedy, Jr., M.D., Associate Director for Program Planning and Evaluation, OD, NIH

Coordinator: Bryan Mitchell, Executive Assistant for Planning and Evaluation, OASPE

Government Members:

Dr. Louis Wienckowski, Director
Division of Extramural Research Programs, HSMHA

Dr. Joseph A. Lieberman
Assistant Administrator for Research & Development
CPEHS

Dr. James F. Garrett, Assistant Administrator,
Research Demonstration and Training, SRS

Dr. Andrew Molnar, Chief, Instructional Materials and Practices Branch, Division of Higher Education Research, OE

Consultants:

Dr. Martin Cherkasky
Director, Montefiori Hospital
New York

Supplemental Government Members Nominated by Chairman:

Dr. James F. Dickson, NIGMS, NIH
Dr. Kenneth Endicott, NCI, NIH
Dr. G. Burroughs Mider, NLM, NIH
Dr. Frederick L. Stone, NIGMS, NIH
Dr. Robert W. Berliner, OD, NIH
Dr. John R. Seal, NIAID, NIH
Dr. Marjorie P. Wilson, OD, NIH
Dr. Ronald Lamont-Havers, OD, NIH

Supplemental Consultants Nominated by Chairman:

Dr. Robert M. Bucher
Dean, Temple University School of Medicine
Philadelphia, Penn.

Dr. John A. D. Cooper
President, AAMC
Evanston, Illinois

Dr. James Clifton
Vice Chairman of Medicine
University of Iowa
Iowa City, Iowa

Dr. Dan C. Tosteson
Duke University School of Medicine
Durham, North Carolina

Dr. John Burns
Vice President in Charge of Research
Hoffman-LaRoch Co.
Nutley, New Jersey

Dr. Douglas D. Bond
Professor of Psychiatry
University Hospitals
Cleveland, Ohio

Dr. Saul J. Farber
New York University
New York, N.Y.

Dr. John R. Hogness
Chairman, Health Sciences Division
Univ. of Washington School of Medicine
Seattle, Washington

Dr. John V. Taggart
Chairman, Dept. of Physiology
Columbia Univ. College of Physicians and Surgeons
New York, N.Y.

Dr. Dennis Watson
The Univ. of Minnesota Medical School
Minneapolis, Minnesota

Dr. Milton Eisenhower
** President Emeritus
Johns Hopkins University
Baltimore, Maryland

* Dr. Robert L. Sinsheimer
Chairman, Division of Biology
Calif. Institute of Technology
Pasadena, California

* Dr. Clifford Grobstein
Vice Chancellor for Medicine & Biological Sciences
and Dean
School of Medicine, Univ. of Calif.
LaJolla, California

* Dr. William D. McElroy, Chairman, Dept. of Biology
Johns Hopkins Univ.
Baltimore, Maryland

* Dr. Wendell M. Stanley
Director, Virus Laboratory
University of California
Berkeley, California

* Dr. Seymour Kety, Dept. of Psychiatry
Massachusetts General Hospital
Boston, Massachusetts

* Dr. Klaus Hofmann
Director, Protein Research Laboratory
Univ. of Pittsburgh School of Medicine
Pittsburgh, Pennsylvania

<u>Resource Staff Nominated by Chairman</u>:

Dr. Herbert Rosenberg, ADPPE, NIH
Dr. Philip S. Chen, Jr., ADPPE, NIH
Mr. David Tilson, ADPPE, NIH
Mrs. Lucille Reifman, ADPPE, NIH
Mr. Joseph Rosenthal, ADPPE, NIH
Dr. Richard Stephenson, ADERT, NIH

Read draft Reports and Issue Papers and discussed in small groups with staff. Formal reaction by letter to follow.

Discussed the issues posed in the memorandum of April 7 from the Assistant Secretary for Planning and Evaluation

APR 2 5 1969

Dear Dr. Eisenhower:

Many thanks for a most enjoyable luncheon and a very profitable discussion. The trip to Baltimore was an extremely valuable experience for me and particularly useful as we begin the planning cycle under a new Administration willing to take a fresh and unbiased look at traditional goals and programs.

While you discussed a broad array of problems and issues, the following are the impressions I carried away of your views on matters relevant to the National Institutes of Health.

--NIH programs had had the cumulative effect of creating a new and very different balance between the traditional functions of a medical school--teaching, research and service. In the two decades which followed World War II, research funding was used to strengthen schools because it was not possible to support education directly.

--The research "plant"--space and people--created since 1945 should be maintained, lest a valuable national resource be under-utilized.

--Future growth should place considerably more emphases on educational support and less on research than in the past.

--Flexible institutional support, such as the general research support grants of the NIH, under whose terms and conditions the officers and the faculty of an academic institution make the decisions on how the funds are to be used, are extremely valuable to a university. It was your estimate that in the Johns Hopkins University School of Medicine, producivity equivalent to that achieved by project grants could have been obtained with about 25 percent fewer dollars, had all Federal funding been of flexible character of general research support grants.

--Training grants from the NIH had been very worthwhile investments of support, not only in the medical school but also in the biomedically oriented departments of the other graduate schools of the university.

--The "play of the market" operates effectively to regulate the distribution of graduate students across fields of science and probably constituted a more efficient mechanism than central planning. Graduate students are sufficiently perceptive to seek training only in fields that have a high probability of yielding long-term career opportunities.

(Comment: I tend to interpret this, in the NIH framework, to ascribe considerable importance to "application pressure," i.e., to the relative magnitude of requests for support from the various disciplinary areas.)

--Development of a large number of strong and nationally significant universities and more equitable geographic distribution of research fund throughout the country, while worthy and desirable objectives, should not be achieved by taking funds from presently strong isntitutions.

--The overall flow of funds into biomedical research and education will indubitably increase in the future. The new funds should be deployed so as to accelerate growth for the more geographically isolated and the less research-oriented institutions than has traditionally been the case.

--Any contemplated changes in the amount and pattern of funding to the universities should be accomplished gradually. Abrupt reduction in funding would create havoc in medical schools of national stature, with large programs of research, graduate and postdoctoral education.

I was, of course,most interested in your views on the question of "categorical" versus "institutional" grants, since I was responsible for the administration of the general research support grant program of the NIH until September last. Our experience has been that it is very difficult to make a salable (with the public) case for the :general" grant, a fact that has resulted in the initiation of an extensive evaluative study of our 7-year experience with this type of support. Someone on our staff may try to get some of your time to help us in the judgmental aspects of the evaulation.

As I am sure you are aware, categorical grants possess a degree of concreteness that makes their nature and purpose rapidly and rather easily understandable to the non-technical people in the Executive and Legislative Branches who review and approve NIH budget requests.

Members of Congress seem to feel that their constituencies feel better served by national investments in specific categories such as "Cancer," "Heart Disease," etc.

If I have misconstrued your views, please do give me a call and straighten me out. Should you have a few minutes to peruse the issue paper on institutional stabilization, I would appreciate any comments you might wish to make.

Once again, many many thanks for the generous gift of time and energy, and for your gracious hospitality. I am doubly grateful in view of the enormous physical and emotional stresses which have been placed on you in the last few months.

Sincerely yours,

(Signed) Thomas J. Kennedy, Jr.

Thomas J. Kennedy, Jr., M.D.
Associate Director for Program
Planning and Evaluation

Dr. Milton Eisenhower
12 Bishops Road
Baltimore, Maryland 21218

TJKennedy/grs
April 25, 1969

THE JOHNS HOPKINS UNIVERSITY

. EISENHOWER
ENT EMERITUS
CHARLES STREET
, MARYLAND 21210

April 28

Dear Doctor Kennedy:

Your letter of April 18, written to me many days prior to our luncheon, reached me only today. Why this delay I do not know.

On my desk I have the materials you sent with your letter of the 18th, the booklet on DHEW Obligations to Medical Schools, and a file headed ISSUE PAPER: STABILIZATION OF MEDICAL SCHOOLS.

I am not sure whether you have been expecting me to comment on these materials beyond what I said when we had lunch together. I really have nothing to add. Federal research grants, training grants, and grants for construction have caused the leading graduate and professional universities to expand greatly; any serious diminution of Federal support would have the most serious consequences, especially for the private, independent institutions.

Using Johns Hopkins as an example: When I came here in 1956, the appropriation for the School of Medicine was $4 million, almost none of which was Federal money. In 1967, my last year of active service, the School had an appropriation of about $21, more than $8 million of which was private, the remainder being Federal. It would be unrealistic to suppose that the School can increase its private support above the $8 million just mentioned. Hence, a reduction of Federal funds must result in less research, inability to keep open a greatly expanded physical plant, and perhaps some modest cut-back in the number of medical students, especially at the residency and other post-doctoral levels. I feel strongly that if the Federal government feels it must give greater support to a larger number of colleges and universities, this must be done by increasing the total Federal appropriation for health research, teaching, and service, not by decreasing support to some institutions and increasing it to others.

The second point I made in our conversation was that there should be a <u>gradual</u> increase in Federal general support of Medical Schools, indeed of all of higher education, and an equally gradual reduction in project grants. However, categorical aid should never be eliminated, for it is by this method that changing national needs can best be met with assurance.

My secretary is in Europe, so this brief and inadequate letter proves that my typing is inferior.

Sincerely yours,

Milton S. Eisenhower

12

THE JOHNS HOPKINS UNIVERSITY

. EISENHOWER
NT EMERITUS
CHARLES STREET
MARYLAND 21210

April 30

Dear Doctor Kennedy:

Our letters have crossed in the mails.

Your summary of our discussion is excellent in most respects. My modifications are minor.

In the sixth paragraph, page one, you indicate that I said the Johns Hopkins School of Medicine's general productivity (in education, research, and patient care) could have been increased about 25 percent had all grants been flexible. I suggest two changes. The figure 25 percent is much too precise. I would generalize by saying that general grants would give greater balance to a medical program and thus greater efficiency and productivity. Second, as I indicated to you in my letter, I would not eliminate all project grants, recognizing that national interests will often require them.

Your comment indicating that general support is not propular in governmental circles causes me to point out that for a very long time the Federal government has been making three types of broad annual grants to the Land Grant Colleges and Universities: For agricultural research, agricultural extension, and general support of the institutions, not eliminating the liberal arts. These must of course be matched by the States.

(My secretary is on vacation and I am leaving for Europe. This letter I have typed myself, which is probably quite evident).

Sincerely,

INCREASING KNOWLEDGE
NIH, NLM and NIMH Program and Financial Plan
Realistic Plan
1968 - 1975
(in millions of dollars)

	1968	1969	1970	1971	1972	1973	1974	1975
Increasing Knowledge	1,174	1,205	1,165	1,740	2,038	2,310	2,639	3,024
National Library of Medicine	27	21	20	68	77	86	94	98
Grants	7	8	6	22	25	28	31	31
Direct Operations	10	12	14	21	27	33	38	42
Construction Grants	10	1	--	25	25	25	25	25
Institutes and Research Divisions	1,083	1,102	1,072	1,564	1,819	2,094	2,395	2,751
Research	795	811	823	1,031	1,233	1,436	1,667	1,943
Research Grants	562	563	572	685	815	933	1,074	1,239
General Research Support Grants	55	53	53	89	112	141	161	186
Research Contracts	103	113	115	150	179	217	264	322
Other Direct Operations	75	82	83	107	127	145	168	196
Training and Fellowships	187	198	179	333	367	408	452	499
Construction (HRFC)	38	21	--	120	127	141	148	160
Research Supporting Activities	63	72	72	80	92	109	128	147
National Institute of Mental Health	60	67	69	87	102	119	143	166
Research Grants	36	36	37	43	50	59	69	80
Research Contracts	1	1	1	3	4	6	7	9
General Research Support	5	8	8	11	13	14	21	24
Extramural Research Support	1	2	2	3	4	4	5	5
Intramural Research	17	20	21	27	31	36	41	48
Buildings and Facilities	4	15	4	28	45	11	3	1

NIH-OD-ADPPE-OPA
May 6, 1969

NIH, NLM and NIMH Program and Financial Plan
Alternative Plan
1968 - 1975
(in millions of dollars)

	1968	1969	1970	1971	1972	1973	1974	1975
Increasing Knowledge	1,174	1,205	1,165	1,278	1,429	1,528	1,645	1,773
National Library of Medicine	27	21	20	22	24	25	28	30
Grants	7	8	6	7	8	8	9	10
Direct Operations	10	12	14	15	16	17	19	20
Construction Grants	10	1	--					
Institutes and Research Divisions	1,083	1,102	1,072	1,209	1,304	1,404	1,513	1,633
Research	795	811	823	880	947	1,014	1,089	1,169
Research Grants	562	563	572	612	655	701	750	803
General Research Support Grants	55	53	53	55	59	61	65	70
Research Contracts	103	113	115	124	134	145	157	169
Other Direct Research Operations	75	82	83	89	99	107	117	127
Training and Fellowships	187	198	179	209	231	257	284	314
Construction (HRFC)	38	21	--	44	47	50	52	58
Research Supporting Activities	63	72	72	76	79	83	88	92
National Institute of Mental Health	60	67	69	81	89	98	103	109
Research Grants	36	36	37	40	43	46	49	53
Research Contracts	1	1	1	1	1	1	1	1
General Research Support	5	8	8	10	11	14	15	16
Extramural Research Support	1	2	2	3	3	4	4	4
Intramural Research	17	20	21	27	31	33	34	35
Buildings and Facilities	4	15	4	7	12	1	1	1

NIH-OD-ADPPE-OPA
May 6, 1969

NIH, NLM and NIMH Program and Financial Plan
Realistic Plan
1968 - 1975
(1969 = 100)

	1968	1969	1970	1971	1972	1973	1974	1975
Increasing Knowledge	97.4	100.0	96.7	144.4	169.1	191.7	219.0	251.0
National Library of Medicine	128.6	100.0	95.2	323.8	366.7	409.5	447.6	466.7
Grants	87.5	100.0	75.0	275.0	312.5	350.0	387.5	387.5
Direct Operations	83.3	100.0	116.7	175.0	225.0	275.0	316.7	350.0
Construction Grants	1000.0	100.0	0.0	2500.0	2500.0	2500.0	2500.0	2500.0
Institutes and Research Divisions	98.3	100.0	97.3	141.9	165.1	190.0	217.3	249.6
Research	98.0	100.0	101.5	127.1	152.0	177.1	205.5	239.6
Research Grants	99.8	100.0	101.6	121.7	144.8	165.7	190.8	220.1
General Research Support Grants	103.8	100.0	100.0	167.9	211.3	266.0	303.8	350.9
Research Contracts	91.2	100.0	101.8	132.7	158.4	192.0	233.6	285.0
Other Direct Research Operations	91.5	100.0	101.2	130.5	154.9	176.8	204.9	239.0
Training and Fellowships	94.4	100.0	90.4	168.8	185.4	206.1	228.3	252.0
Construction (HRFC)	181.0	100.0	0.0	571.4	604.8	671.4	704.8	761.9
Research Supporting Activities	87.5	100.0	100.0	111.1	127.8	151.4	177.8	204.2
National Institute of Mental Health	89.6	100.0	103.0	130.0	152.2	177.6	213.4	247.8
Research Grants	100.0	100.0	102.8	119.4	138.9	163.9	191.7	222.2
Research Contracts	100.0	100.0	100.0	300.0	400.0	600.0	700.0	900.0
General Research Support Grants	62.5	100.0	100.0	137.5	162.5	175.0	262.5	300.0
Extramural Research Support	50.0	100.0	100.0	150.0	200.0	200.0	250.0	250.0
Intramural Research	85.0	100.0	105.0	135.0	155.0	180.0	205.0	240.0
Buildings and Facilities	26.7	100.0	26.7	186.7	300.0	73.3	20.0	6.7

NIH-OD-ADPPE-OPA
May 6, 1969

NIH, NLM and NIMH Program and Financial Plan
Alternative Plan
1968 - 1975
(1969 = 100)

	1968	1969	1970	1971	1972	1973	1974	1975
Increasing Knowledge	97.4	100.0	96.7	106.1	118.6	126.8	136.5	147.1
National Library of Medicine	128.6	100.0	95.2	104.8	114.3	119.0	133.3	142.8
Grants	87.5	100.0	75.0	87.5	100.0	100.0	112.5	125.0
Direct Operations	83.3	100.0	116.7	125.0	133.3	141.7	158.3	166.7
Construction Grants	1000.0	100.0	--					
Institutes and Research Divisions	98.3	100.0	97.3	109.7	118.3	127.4	137.3	148.2
Research	98.0	100.0	101.5	108.5	116.8	125.0	134.3	144.1
Research Grants	99.8	100.0	101.6	108.7	116.3	124.5	133.2	142.6
General Research Support Grants	103.8	100.0	100.0	103.8	111.3	115.1	122.6	132.1
Research Contracts	91.2	100.0	101.8	109.7	118.6	128.3	138.9	149.6
Other Direct Research Operations	91.5	100.0	101.2	108.5	120.7	130.5	142.7	154.9
Training and Fellowships	94.4	100.0	90.4	105.6	116.7	129.8	143.4	158.6
Construction (HRFC)	181.0	100.0	--	209.5	223.8	238.1	247.6	276.2
Research Supporting Activities	87.5	100.0	100.0	105.6	109.7	115.3	122.2	127.8
National Institute of Mental Health	89.6	100.0	103.0	120.9	132.8	146.3	153.7	162.7
Research Grants	100.0	100.0	102.8	111.1	119.4	127.8	136.1	147.2
Research Contracts	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
General Research Support	62.5	100.0	100.0	125.0	137.5	175.0	187.5	200.0
Extramural Research Support	50.0	100.0	100.0	150.0	150.0	200.0	200.0	200.0
Intramural Research	85.0	100.0	105.0	135.0	155.0	165.0	170.0	175.0
Buildings and Facilities	26.7	100.0	26.6	46.7	80.0	6.7	6.7	6.7

NIH-OD-ADPPE-OPA
May 6, 1969

INCREASING KNOWLEDGE
NIH, NLM and NIMH Program and Financial Plan
Realistic Plan
1968 - 1975
Average Annual Increase

	1970 to 1971	1971 to 1975	1970 to 1975
Increasing Knowledge	49.4	14.8	21.0
National Library of Medicine	240.0	9.6	37.4
Grants	266.7	8.9	38.9
Direct Operations	50.0	18.9	24.6
Construction Grants	-	-	-
Institutes and Research Divisions	45.9	15.2	20.7
Research	25.3	17.2	18.7
Research Grants	19.8	16.0	16.7
General Research Support Grants	67.9	20.2	28.5
Research Contracts	30.4	21.0	22.8
Other Direct Research Operations	28.9	16.3	18.8
Training and Fellowships	86.0	10.6	22.8
Construction (HRFC)	-	7.4	-
Research Supporting Activities	11.1	16.4	15.3
National Institute of Mental Health	26.1	17.5	19.2
Research Grants	16.2	16.8	16.7
Research Contracts	300.0	31.6	55.2
General Research Support	37.5	21.5	24.6
Extramural Research Support	50.0	13.6	20.1
Intramural Research	28.6	15.5	18.0
Buildings and Facilities	700.0	-56.5	-24.2

NIH-OD-ADPPE-OPA
May 6, 1969

NIH, NLM and NIMH Program and Financial Plan
Alternative Plan
1968 - 1975
Average Annual Increase

	1970 to 1971	1971 to 1975	1970 to 1975
Increasing Knowledge	9.7	8.5	8.3
National Library of Medicine	10.0	8.1	8.4
Grants	16.7	9.3	10.8
Direct Operations	7.1	7.4	7.4
Construction Grants	-	-	-
Institutes and Research Divisions	12.8	7.8	8.8
Research	6.9	7.3	7.3
Research Grants	7.0	7.0	7.0
General Research Support Grants	3.8	6.2	5.7
Research Contracts	7.8	8.0	8.0
Other Direct Research Operations	7.2	9.3	8.9
Training and Fellowships	16.8	10.7	11.9
Construction (HRFC)	-	7.1	-
Research Supporting Activities	5.6	4.9	5.0
National Institute of Mental Health	17.4	7.7	9.6
Research Grants	8.1	7.3	7.4
Research Contracts	0.0	0.0	0.0
General Research Support	25.0	12.5	14.9
Extramural Research Support	50.0	7.4	14.9
Intramural Research	28.6	6.7	10.8
Buildings and Facilities	75.0	-38.5	-24.2

NIH-OD-ADPPE-OPA
May 6, 1969

Issue Paper: Stabilization of Medical Schools

SUMMARY

The Stake of DHEW in the Nation's Medical Schools

The medical schools are the principal instrumentalities for achieving national goals to support high quality medical research, to strengthen and expand education and training of health professionals--particularly physicians--and to improve medical care. Since DHEW is responsible for administering the programs for achieving these national goals, it has a large stake in the strength and stability of these institutions.

Why DHEW Should Stabilize Financing of Medical Schools

DHEW is dependent on the medical schools to accomplish its missions in health research, the training of health professionals, and improving medical care. In FY 1967, medical schools received $641.4 million from DHEW (exclusive of reimbursements under the Medicare and Medicaid programs). This was well over 60% of their total expenditures. They are complex, delicately balanced, and--in almost all instances--in financially precarious condition. Perturbations in any of their sources of financial support have impacts that affect the institutions' ability to carry out all of their functions--even though the perturbation may occur in a source of support tied to a specific activity.

Medical schools are unique among institutions of higher education in the role they must play in achieving explicit national goals for which DHEW is responsible, and in their dependence on DHEW funding to function at current--not to mention expanding--output levels.

Advantages and Disadvantages of Stability

Effective performance of the "core" educational, service, and research functions of the medical schools requires assurance of a minimum funding level to maintain a full-time faculty (and associated supporting staff and services) large enough to perform these functions. At the present time, these funds are obtained from a variety of Federal and non-Federal sources. Most are tied to a particular aspect of an institution's activities. The annual decisions on the amount

going to any institution are made by program administrators whose formal concern is only with a particular aspect of the medical school's functions. They are not generally aware of--or even concerned with--the relationship of their decisions to those of others responsible for other sources of the institution's financial support. From the institution's standpoint, however, unless the funds made available through this uncoordinated process reach a certain level, their ability to perform their core functions are threatened.

There are some problems, however. One is to determine the amount of Federal support in such a way as to prevent erosion of non-Federal support. The other is to retain the advantages of the project grant system and the peer judgment reviews for scientific merit to ensure continued support only for high quality scientific activities. One way is to use institutional support for the "core" educational functions (which would embrace a modest amount of research) and the project grant for extended research which would be supported strictly on the basis of scientific merit.

The Overall Stabilization Issue

Outlays for stabilizing the core educational functions of the medical schools will be amenable to estimation as soon as sophisticated cost analyses of the operations of these complex institutions have been completed. Such data, however, will not answer the overriding policy issue of what should determine quantitatively the proper Federal share of these outlays for a mixed group of large and small, rich and poor, public and private institutions.

Stabilization of the research functions over and above those included in the core educational program would be viewed as a research system problemrather than an individual institutional problem. Outlays for the system must be measured against the present level as a reference point, with planning predicated on reasonably firm long-range commitments to slowly changing funding levels. The play of the market--national competition--will produce transient dislocations for specific individuals and specific academic institutions, but this must be accepted as part of the price of a vigorous national research effort. The impact of some of the more egregious errors that will occasionally occur in the operations of this kind of a process can be offset by the availability to institutions of a flexible fund of modest size, such as a general research support grant.

These recommendations should be viewed as a broad framework for discussion, however, because it would be a serious mistake to underestimate the complexity of the actual situation and to rely too readily on a simplistic model for analysis.

ISSUE PAPER: STABILIZATION OF MEDICAL SCHOOLS

The Issue Posed

The issue posed by the Office of the Assistant Secretary for Planning and Evaluation is as follows:

> *On what bases should the Department attempt to stabilize the financing of medical schools, as opposed to any other institutions? Is there a critical point at which some instability ceases to be advantageous, i.e., what are the advantages and disadvanatages of stability and instability? What would be the needed outlays to engender stability? Is stability more important than national competition for research grants, say? That is, in order to obtain stability, assuming budget constraints, what other aspects of research support should be diminished?*

The Stake of the DHEW in the Nation's Medical Schools

There are three intersects of sets of interest between the DHEW and the schools of medicine in this country related, respectively, to medical research, medical education, and medical services. It is worthwhile to consider the evolution of the existing relationships in each area.

Medical Research. Lineal descendents of elements of the DHEW have been engaged in biological and medical (biomedical) research since 1887, but for purposes of this discussion, the "modern era" began with: the legislative reaffirmation of basic authorities to conduct and support research contained in the sweeping revisions of the Public Health Service Act of 1944 (P.L. 78-410); and the Executive Order which transferred administrative responsibility for a number of contracts between the U.S. Government (The Office of Scientific Research and Development) and universities to the NIH. Since that time, a clear public mandate for Federal support of biomedical research has emerged. The clarity and force of public policy in this arena are reflected in the specific substantive legislative actions to establish:

- a National Institute of Mental Health (P.L. 79-487, 1946)
- A National Heart Institute (P.L. 80-655, 1948)
- A National Institute of Dental Research (P.L. 80-755, 1948)
- other research institutes through the Omnibus Medical Research Act (P.L. 81-692, 1950).

he history of Executive Branch requests for appropriations authority and ongressional appropriations acts which have expanded public investment in iomedical research through the NIH from a level of about $3 million in Y 1946 to one of $888 million (estimated in FY 1969) lend further supporting vidence. Public policy has led but the private sector, particularly ndustry, has grown at a most parallel rate, albeit at a lower level, as ay be seen from Table I. It is inconceivable that a growth rate of this agnitude could be sustained unless a very broad national consensus operated n its favor.

The DHEW assumed and has maintained preeminence in the support of iomedical research, as may be seen from Table II. Departmental expenditures re 2.5 times those of the combination of its three nearest competitors, the AEC, the NASA, and the DoD. The NIH has been the most significant component of the DHEW in this effort.

Research funds appropriated to the DHEW have been expended in three major areas (Table III): Federal laboratories, especially the laboratories and Clinics of the NIH in Bethesda; educational institutions, especially schools of medicine; and nonprofit institutions excluding educational institutions, predominantly the Nation's great research and teaching hospitals. Industrial funds, mainly from the pharmaceutical industry, have been spent largely in "in-house" laboratories with particular emphasis on product development and improvement.

In the early years of the modern era, DHEW decisions were dictated by virtue of the fact that the only available pool of research competence that could be mobilized in response to declarations of public purposes was located in academic (principally medical schools) or quasi-academi institutions. As the academically based efforts grew by virtue of research grant funds, research manpower development awards and institutional research support, a reasonably adequate science base began to emerge. Thus in selected areas, opportunities for developmental programs in which industrially based components played a part were recognized. At this juncture, the fraction of DHEW funds allocated to profit-making organizations began to grow to significant proportions, but is still extraordinarily small compared to the proportion of the research and development funds appropriated to the DoD, the NASA, and the AEC committed to industrial performers.

In 1950, about 1 percent of the total national expenditures for health were invested in research and the enterprise was pitifully small. The major limitation on its expansion was the availability of suitably trained manpower, and of environments attractive enough to investigators to compete successfully with medical practice as a stable and enduring career for them.

The DHEW, especially through the NIH, exerted strong leadership to increase the supply of research manpower through a selective but vigorously administered training and fellowship program and through programs for the support of research facility construction and for broad institutional research programs. Thereby the institutional environment in which an expanded research enterprise could flourish was substantially strengthened. Again, in national competition based on scientific merit, academic institutions and particularly medical schools proved to represent, in the judgments of the statutory National Advisory Councils, the most likely agents to fulfill the objectives of National policy.

Table IV indicates that of all DHEW support to academic institutions (including that from the OE) about 29 percent goes to medical schools. More than half (54 percent) of the DHEW support for research and development at academic institutions was concentrated in the medical schools; these schools also accounted for a large share of graduate and post-doctoral training (40 percent) and fellowships (30 percent) support. On the other hand, aid for undergraduate education represented only a small fraction--4 percent--of total R&D expenditures of the agency in 1967. Funds for teaching facilities and "other" support accounted for sizeable shares of the DHEW total--11 percent and 23 percent respectively.

Further evidence of the extent to which the DHEW relies on the Nation's schools of medicine to accomplish its research mission may be seen from a perusal of Table V and VI. Of the $462.7 million invested in institutions of higher education by the NIH in 1967, $299.2 million--65 percent--went to medical schools, narrowly defined. Of the total of $593.3 million expended by the NIH for research in that year, $363.7 million--61 percent went to medical schools and hospitals; most of the latter were affiliated with the former. Research manpower development funds and institutional research support, again directly or indirectly on the basis of peer judgment review in national competition with scientific merit as the fundamental criterion, have been concentrated to a comparable degree in schools of medicine.

Medical Education. Public policy on medical education has undergone a profound change in the last few years. Historically, this function was viewed as one appropriate for local government or for the private sector, and traditional attitudes remained essentially unquestioned until relatively recent years. In the 1950's increasing recognition was accorded: the disparity between the aspirations of our people for health services and the number of physicians in the population; the remarkable geographic mobility characterizing the educational experience of the physician from college through medical practice; and the extraordinary costs of medical education. In view of these attributed, medical education came increasingly to be viewed as a national responsibility and the country's medical schools as national assets. The change in attitude doubtless reflected the important contributions made by them to the Nation's health through discoveries made possible by the strength conferred by support for research.

These attitudinal changes culminated in the enactment of the Health Professions Educational Assistance Act in 1963, providing aid for the construction of teaching facilities, and its extension in 1965 to include: Institutional support for improving the educational process; student assistance in the form of loans and scholarships; and funds for research and development in educational methods, curriculum, etc. The DHEW was assigned responsibility to administer this program to support the educational functions of the medical schools.

Medical Service. This domain has long been the nearly exclusive responsibility of the private sector. The Federal Government's participation was sharply circumscribed, to certain beneficiary groups such as members of the Armed Services, veterans, merchant seamen, American Indians. The responsibility of State and municipal governments generally did not extend beyond the care of the indigent. Several important public policy decisions have been reached in recent years. The "Heart Disease, Cancer and Stroke Amendments of 1965" (P.L. 89-239) created the Regional Medical Programs to expedite the application of discovery in the practice of medicine and to facilitate the flow of information from the (usually academic) medical center to the community level. The Social Security Act was amended in 1965 to include Titles XVIII and XIX--Medicare and Medicaid--under which the Federal Government undertook a major responsibility for the funding of the health care of specified groups of citizens. The Partnership for Health Amendments of 1967 (P.L. 90-174) extend the role of the Federal Government in the systems and institutional forms for the delivery of health services. The responsibilities assigned the DHEW in the administration of these statutes make even more obvious the Department's need to rely on the Nation's schools of medicine, if it is to successfully respond to public policy mandates.

In summary, since the end of World War II, there has been an increasing overlap in: the goals and objectives of the Nation's schools of medicine; and the program goals of the Federal Government, as expressed in a long series of Executive and Legislative actions. Medical research has become almost totally a public enterprise; medical education has been broadly perceived as at least in part, a public responsibility; and health care has taken on a significant public dimension. In all of these arenas, the prime locus of Federal responsibility is the DHEW, and the instrumentality most essential for the realization of Departmental goals is the Nation's system for medical education.

DHEW Justification for Stabilizing the Financing of Medical Schools

With this background, it becomes possible to respond to the first issue posed:

On what bases should the Department attempt to stabilize the financing of medical schools, as opposed to any other institutions?

The answer is quite clear. The DHEW cannot achieve its missions in health research, in health education and in health services without strong viable schools of medicine; hence the need to find ways and means of insuring their continued existence and integrity, their responsiveness to national goals, their creativity in research and scholarship and their productivity of highly qualified physicians in numbers adequate for national needs.

As far as the relative importance of stabilizing medical schools *vis a vis* other institutions, it must be recognized that few other genres occupy so unique a position in undergirding a multiplicity of very important and clearly articulated national objectives. To a variable (and lesser) extent, academic institutions dedicated to the training of other classes of health professionals have attributes that recommend Departmental efforts at institutional stabilization; schools of dentistry, public health, nursing, veterinary medicine and pharmacy might be mentioned. Outside of the health area, responsibility for stabilizing other classes of academic institutions has, to the extent that it has been recognized, been assumed by or assigned to other Federal agencies. The viability and integrity of the institutions engaged in agricultural research falls within the purview of the USDA; the NSF has assumed responsibility for institutions devoted to science qua science; and mission-oriented agencies such as the DoD, the AEC and the NASA have--through a variety of mechanisms, the funding of which has been dwarfed by the comparatively enormous outlays of these agencies for industrial development--assisted in the stabilization of schools in the engineering sciences.

Advantages and Disadvantages of Stability

Financial stability of academic institutions, as used in this issue paper, is meant to connote insurance against rapid and precipitate decline in support to a level which threatens the ability of the institution as a whole, or important components of it, to fund its essential activities. There is no reasonable expectation that a societal institution will long survive without the ability to guarantee the funding of these activities on terms and conditions competitive with other opportunities available to individuals called upon to perform the functions. While the need for stable financing is an absolute, its magnitude depends on the definition of the core functions of a medical school and their variation from school to school. It is the position of the NIH that every medical school should view its core functions in addition to the training of undergraduate medical students as including

a modest level of effort in: the training of graduate and postdoctoral students; biomedical research; patient care activities essential for teaching and demonstration; and education in at least some of the other health and allied health professions. Many medical schools presently are qualitatively and quantitatively deficient in this set of core functions. It is the conviction of this agency that such schools are in dire need of the resources to establish and perform this complex of functions.

A number of medical schools conduct all of the previously mentioned functions at a level approximately adequate--no more, no less--for the education of a competent physician. Funding stability at this level should be guaranteed for all medical schools and will be adequate for those whose sole objective is the education of competent physicians.

A number of medical schools have become the hubs of great medical centers, and have become coupled, *inter alia,* with extended research activities on a substantial scale responsive to the nation's call to solve serious health problems. Stability requirements for this research element must be adjudged against a different set of criteria on which there is no consensus and by a calculus for which no rational body of theory exists. At one extreme, research may be viewed as a luxury, supported at the caprice of a benefactor, for a variety of reasons including the conviction that, over time, it will yield rich dividends. It is theoretically possible to view many medical schools as composed of a core of teaching, research and service activities, around which research "institutes" have blossomed. While in practice, extensive commingling of core and extended research functions takes place, it is possible for purposes of discussion to examine the unique problems of stabilization of the financing of research components beyond a level required for a minimally acceptable educational experience.

The elements in the discussion involve recognition of the fact that:

- Research has been established in public policy decisions as the key process for attaining well defined national goals.

- Research is an activity that is not within the competence or interest of all professionals in any field.

- Research careers are frequently characterized by periodicity of creativeness.

- Research competence has no absolute measure. Peer judgment, however fallible, is the best method of evaluation yet devised.

- Research missions of the Federal Government are not isomorphic with the goals of research scientists.

- Research scientists have attractive alternative career opportunities. Commitment to a career in research would not appear wise unless reasonable expectations were apparent that competent performance would command fiscal support.

- Research enterprises achieve excellence by slow, organic growth, but can be disassembled with remarkable speed, as scientists of stature are diverted to other careers.

The Federal establishment must, in the light of its statutory responsibilities, be dedicated to the creation and preservation of a network of individuals and institutions committed to scientific research of the highest calibre and oriented in interest to the same broad objectives as are embodied in the missions of the Federal agencies. The research project grant has been an ideal instrument to assure mission relevance and, operated in a peer judgment review context, to control the quality of the effort.

Achievement of Federal research objectives will depend on the flow of funds into the system to permit a reasonably constant level of activity. Sharp transient funding increases can, with difficulty, be managed. Decreases, transient or permanent, can lead to rapid and permanent loss of key personnel, with sudden collapse of the system.

As long as the total support for the national effort is predictable, local perturbations are manageable. Institutions recognize that the heart of their research enterprises must grow slowly and are not unduly disturbed by minor unexpected fluctuations in support, particularly if contingency funds are available to support the truly creative scientist who, for a short period of time, is unable to compete successfully on a national scale. Institutions in addition are expert at facilitating the timely movement of faculty from a career dependent upon research support won in national competition to one more clearly related to the educational functions and financed through educationally justified funds.

Scientists recognize that at some point, their creative powers wane and anticipate this in their career planning. They are fully aware that they cannot expect to receive support when their performance and their proposals cease to be relevant or competent, and that at such a point they must be prepared to change career direction--to teaching or administration--within the academic institution or--to medical practice, industrial management or other service activities--outside it. On the other hand, institutions should have some assurance that newly recruited research-oriented faculty members, successful in national competition, could receive support from the funding agency equivalent to that formerly tendered the faculty member retiring from the fray.

The stabilization of the extended research component of a modern medical center then depends on:

- a long term commitment by the Federal agency to a level of funding for nationally competitive project grant research that will not be subject to capricious and unexpected fluctuations, particularly in a downward direction.

- The availability of research-related contingency funds to be used by academic institutions to handle the transitional as well as capricious local perturbations in the career patterns of individual scholars.

As long as the total system or network of research activity is stabilized, the problems of individual institutions are manageable, except for those whose research programs, for whatever reason, are of small size and marginal quality. Such institutions present special problems which, while important, are not central to the response to this question.

The optimal balance between project grant support and institutional support is an important question. Obviously, *too much* institutional support, leading to establishment of sinecures for research-oriented faculty members, and thereby withdrawing them from the need to compete nationally on the basis of the merit of their work as well as its relevance to the mission of a Federal agency (which presumably is also furnishing the institutional support from which the sinecure is funded) would be undesirable from the point of view of the individual, the institution and the supporting agency. Individuals would miss the stimulation stemming from their sensitivity to the fact that their salary, in whole or in part, directly or indirectly, depended upon their success in national competition. The absence of this creative tension and its consequence--improved performance--would represent a loss, not only to the individual but also to his institution; national competition in a sense serves as part of the promotion review process of academic institutions. Without the quality control achieved through the process of national competition, the capability of the granting agency to monitor and evaluate its investments would be severely compromised. *Too little* institutional support would place the research-oriented faculty members in a very hazardous situation, vulnerable to sudden decrements in salary based on unexpected fluctuations in individual or institutional funding from project research and without prospect of access to offsetting sources of support. Prevalence of this latter situation, in all probability, would be incompatible with a viable national research effort.

The central concern of a discussion of stability of the extended research capacity of the Nation's medical schools turns on the confidence of the research community in the depth, durability and predictability of the Federal commitment and in the resolve of the Government to sustain this commitment in the face of unexpected vicissitudes. The challenge that faces the Federal agencies is to regulate the level of activity in the national system for research in such a way that the extraordinarily creative people who must be coupled to great national and human goals are attracted to research careers and not persuaded that the risks and uncertainties of such careers are unacceptably high.

Outlays Needed for Stability

The outlays needed to engender stability must be defined separately for the "core" educational functions and the extended research activities of a medical school.

Core Educational Functions. As noted earlier, these include teaching, research, and service elements, frequently embedded in a much broader institutional matrix--the modern medical center--in which they coexist with a variably sized extended research activity, with other educational enterprises for other classes of health professional workers, with "optional" service activities related to the medical practices of "geographic" full-time faculty to community importunings, etc.

Estimation of the outlays required to stabilize this core set of functions depends on the solution of two problems: determination of the unit costs for educating a physician; and defining the extent, the determinants and the modifiers of Federal interest in the integrity of the educational aspects of the medical schools.

Unit Costs. The precise accounting for the specific costs of educating the physician, the primary issue under discussion in the present context, has not been accomplished. Several studies published over the last decade have been severely and properly challenged. The preliminary results of an NIH supported study by the Association of American Medical Colleges has recently been completed and tends more to illustrate the complexities of the problem than to provide definitive and unobjectionable information. This study will be extended and refined in the near future. It is already clear that the physician is not a uniform "product" and that the "true" costs will vary over a fairly broad range when estimated for each of the medical schools in the United States.

Federal Interest. While stability requires that the academic institution receive income at least equivalent to the costs incurred, such income is derivable from multiple sources, e.g., endowment; funds appropriated by State or local government; reimbursement for medical services rendered by faculty; Federal support through formula and project (basic and special improvement) grants under the Health Professions Educational Assistance Act; institutional allowances coupled to scholarships; and, partially, research and research training awards of all types. In view of the wide range in size, auspices and traditions among medical schools, and the school-to-school variability in income derived from different sources, it would seem clear that outlays needed for stabilization would have to be determined on a school-by-school basis.

Definition of the proper premises upon which negotiations should be based, revolving chiefly around a delineation and quantification of the Federal role, presents policy issues. While the Federal agencies might hope to exert their stabilizing influence simply by making up the difference between cost and income, the ever-present danger that this process will dry up nonfederal income sources, leading in time to a transfer of the support of the whole teaching function to the Federal agencies, cannot be ignored. While some responsible educators are convinced that medical education is so expensive and all citizens so obviously the beneficiaries that the Federal Government should assume this responsibility in its entirety, a consensus on this point is not apparent at the moment.

In practical terms, the extant combination of Federal programs for institutional support, student assistance and construction of teaching (with necessary research and library) facilities, have contributed substantially toward stabilizing the core educational functions of the Nation's medical schools. Statutory authorities in parts E and F of Title VII provide appropriate mechanisms, if not funds, to effect the goals sought.

Research Functions. The basic imperative to stabilize the extended research functions of the medical schools is a firm assurance that Federal funding of academic research will continue for a long time and at some relatively predictable level. Such an assurance will enable research scientists to evaluate realistically the advantages and disadvantages of a research career and will encourage academic institutions to define long-range research program goals. Distribution of the funds amongst institutions (and *pari passu*, among states and geographic regions) could then be left to the play of the "quality" market, and institutional support funds--allocated as an over-ride on research project funds (e.g. general research support grants)--could be used to iron out acute temporary intra-institutional distributional problems.

A process of this character operates to favor strong schools at the expense of the weak, and results in the concentration of large amounts of research funds in a few institutions and the dispersion of small amounts over many. Such is unavoidable if the Federal Government is to optimize its research investments, with the scientific merit of a project constituting the major determinant of award. In the long run, it is probably to the advantage of the Nation to expand significantly the number of medical schools possessed of great research capability over a broad spectrum of biomedical science. For such purposes, funding frankly designated for institutional development should be made available and invested very selectively in institutions whose potential for greatness can be discerned. By the same token, it is not wise to try to solve the problem of inequitable geographic distribution by compromising scientific judgments on merit.

In summary, outlays for stabilizing the core educational functions of the medical schools will be amenable to estimation as soon as sophisticated cost analyses of the operations of these complex institutions have been completed. Such data, however, will not answer the overriding policy issue of what should determine quantitatively the proper Federal share of these outlays for a mixed group of large and small, rich and poor, public and private institutions.

Stabilization of the research functions over and above those includable in the core educational programs and developed in the last two decades in response to nationally identified needs and goals should be viewed as the problem of the research system rather than that of an individual institution. Outlays for the "system" must be measured against the present level as a reference point, with planning predicated on reasonably firm long-range commitments to gradually changing funding levels. The play of the market--national competition--will produce transient dislocations for specific individuals and specific academic institutions, but this must be accepted as part of the price of a vigorous national research effort. The impact of some of the more egregious errors that will occasionally occur in the operations of this kind of a process can be offset by the availability to institutions of a flexible fund of modest size, such as a general research support account.

The Overall Stabilization Issue

In this paper a somewhat artificial categorization of medical school activities into core educational--including teaching, research and service--functions and extended research functions has been used as a framework for discussion. In the real world of actual operations,

the modern medical school's core functions now includes:

- "extended" research functions, developed in response to a national commitment to solve the problems of disease, disability and premature death.

- "extended" educational functions, developed out of the internal requirements of the existing health care delivery system, and expanded recently in response to a national determination to increase health manpower for care.

- "extended" demonstration and service functions, responsive to rising expectations from communities for far more comprehensive quality health care, as well as to demands created by recent Federal initiatives.

- The separation of "core" from "extended" functions is only possible in statistical terms. Individual faculty members rarely confine their activities to a single "compartment', and through their participation to a variable extent and for variable periods of time in most or all "compartments", effectively blur the distinctions established for discussion purposes.

The medical centers then have been expanding in many directions, in the course of which they have become differentiated into highly complex but unique, distinctive integrated entities. Growth has been rapid, determined to no small extent by Federally initiated pressures. At this stage of history, most are in very delicate and precarious balance. Fiscal perturbations induced by sudden changes in the flow of funds from any of the multiplicity of sources upon which they rely can exert profound, rapid and widespread deleterious effects.

Federal actions related to the stabilization of the nation's schools of medicine must therefore keep clearly in mind the existential situation. Modification of presently operating forces and trends should be undertaken with caution and sensitivity.

FIGURE 1

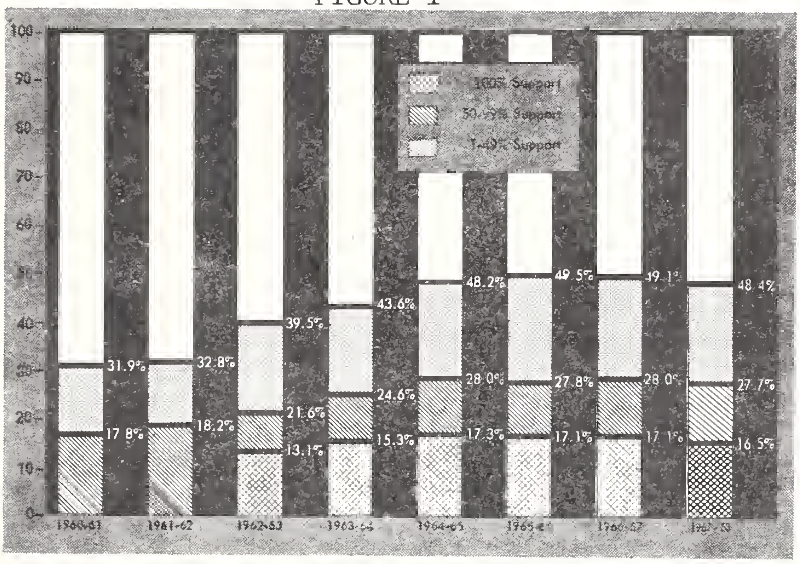
31.9%
32.8%
39.5%
43.6%
48.2%
49.5%
48.4%
24.6%
28.0%
27.8%
27.7%
17.8%
18.2%
21.6%
13.1%
15.3%
17.3%
17.1%
16.5%
1961-62
1962-63
1963-64
1964-65

TABLE 1

Table 12.—Percentage of the Full-Time Faculty Receiving All or Part of Their Salary From Federal Sources

ence ents	% of All Full-Time on Subsidy 1961-1962	1967-1968	Change in Percent	% Professors 1961-1962	1967-1968	Change in Percent	% Associates Professors 1961-1962	1967-1968	Change in Percent	% Assistant Professors 1961-1962	1967-1968	Change in Percent	% Instructors 1961-1962	1967-1968	Change in Percent
ny	28	45	+17	22	43	+21	25	44	+19	32	48	+16	34	45	+11
mistry	36	57	+21	26	50	+24	36	62	+26	47	59	+12	33	58	+25
iology	32	52	+20	17	47	+30	31	52	+21	36	55	+19	46	52	+ 6
ogy	29	40	+11	19	34	+15	32	45	+13	50	41	− 9	27	36	+ 9
acology	37	63	+26	22	53	+31	30	66	+36	49	67	+18	39	70	+31
logy	32	60	+28	26	55	+29	34	64	+30	39	62	+23	27	58	+31
ents															
esiology	9	23	+14	6	24	+18	15	22	+ 7	9	26	+17	8	20	+12
tology	31	58	+27	21	38	+17	33	68	+35	32	69	+37	28	56	+28
ne	37	51	+14	17	46	+29	39	57	+18	47	57	+10	39	41	+ 2
ogy	35	63	+28	14	52	+38	31	73	+42	48	67	+19	40	58	+18
rics-ecology	12	32	+20	9	25	+16	12	37	+25	15	37	+22	12	27	+15
almology	25	52	+27	15	36	+21	41	50	+ 9	35	67	+32	15	50	+35
edics	8	25	+17	8	15	+ 7	4	33	+29	16	28	+12	5	27	+22
yngology	23	46	+23	7	38	+31	40	55	+15	23	44	+21	26	49	+23
rics	26	53	+27	18	43	+25	29	53	+24	31	56	+25	24	54	+30
al icine	22	61	+39	9	48	+39	32	54	+22	28	70	+42	20	62	+42
atry	43	57	+14	26	54	+28	41	63	+22	49	62	+13	47	48	+ 1
Health	32	67	+35	23	49	+26	38	68	+30	39	72	+33	28	75	+47
ogy	19	27	+ 8	13	24	+11	17	33	+16	18	27	+ 9	23	24	+ 1
y	25	35	+10	16	26	+10	25	42	+17	31	39	+ 8	28	35	+ 7
y	14	28	+14	4	24	+20	13	41	+28	27	26	− 1	16	25	+ 9
	31	49	+18	20	42	+22	32	53	+21	37	52	+15	32	45	+13

36

TABLE 2
Total Faculty Salaries and Federal Salary Support by
Level of Federal Support, 1966-67

	Total	Level of Federal Support of Faculty Salaries (dollars in thousands)					
		50% over	40-49%	30-39%	20-29%	10-19%	Less 10%
No. of schools	71	10	12	12	17	15	5
Faculty salaries:							
Total	$288,941	$41,794	$53,994	$62,569	$55,444	$64,232	$10,909
Average	4,070	4,179	4,500	5,214	3,261	4,282	2,182
Federal support:							
Total	93,307	22,785	23,858	22,208	13,522	9,957	975
Average	1,314	2,279	1,988	1,851	795	664	195

ORA/OD/NIH
April 1969

TABLE

Distribution of 71 Medical Schools by
Level of Federal Support of Faculty Salaries, 1966-67

Level of ...l Salary Support	Distribution of schools: Number	Distribution of schools: Percent
Total (thousands)	71	100.0
...000 - 5,000	5	7.0
...000 - 2,999	11	15.5
...000 - 1,999	21	29.6
...500 - 999	18	25.4
...s than 500	16	22.5

ORA/OD/NIH
April 1969

TABLE 4

Distribution of 71 Medical Schools by
Proportion of Federal Support of Faculty Salaries, 1966-67

Proportion of ederal support	Distribution of schools Number	Percent
Total	71	100.0
0% and over	10	14.1
3.3 - 49.9%	22	31.0
5.0 - 33.2%	9	12.7
ess than 25.0%	30	42.2
10.0 - 24.9%	25	35.2
ess than 10.0 %	5	7.0

ORA/OD/NIH
April 1969

TABLE 5

Table 30.—Summary of Medical School Financial Reports, 1958-1967

	1958-1959		1965-1966		1966-1967		Four-Year Colleges	
ces of Support for Sponsored Programs	Colleges Using Source, No.	Amount, $	Colleges Using Source, No.	Amount, $	Colleges Using Source, No.	Amount, $	Minimum	Maximum
d al contracts and grants for teaching and ai ng	85	20,772,182	86	110,730,028	88	126,672,337	100,909	4,771,836
overnment contracts, gifts, and grants for a ing and training	68	4,660,146	74	10,423,085	79	11,544,636	—0—	812,018
t of sponsored teaching and training grant o ams (1 + 2)	85	(25,432,328)	86	(121,153,113)	88	(138,216,973)	102,278	5,478,090
ral contracts and grants for research	85	74,128,157	87	307,401,572	88	344,480,141	256,473	14,036,153
a, city, and county contracts, gifts, and a s for research	43	2,855,127	59	12,081,831	63	12,732,011	—0—	1,645,429
overnment contracts, gifts, and grants for s rch	*	31,937,435	87	48,179,199	88	52,522,271	20,157	2,134,156
wment income restricted for research	34	3,029,630	42	5,506,157	43	6,405,838	—0—	1,017,668
r funds restricted for research	17	1,755,276	15	1,947,659	13	4,091,324	—0—	2,182,772
l of nonfederal support for sponsored re- ch (total items 5 through 8)	85	(39,577,468)	87	(67,714,846)	88	(75,751,444)	20,157	4,047,475
expenditures for sponsored research (4+9)	85	(113,705,625)	87	(375,116,418)	88	(420,231,585)	314,281	17,727,818
ral grants and contracts for foreign teach- programs (included in item 12)			10	(1,322,940)	6	(887,121)	—0—	427,128
ellaneous sponsored programs (exclusive search teaching, training, and student aid)	*	5,099,963	43	17,936,783	39	22,675,558	—0—	11,272,523
l Expenditures for Sponsored Programs ns 3, 10, 12)	**85**	**(144,237,916)**	**87**	**(514,206,314)**	**88**	**(581,124,116)**	**514,294**	**34,478,431**
ces of Support for Regular Operating Pro- ns								
ion and fees	85	24,368,278	87	41,019,126	88	43,943,788	41,400	1,477,385
rhead on federal contracts and grants			87	53,730,487	84	55,410,997	—0—	2,809,703
rhead on nonfederal contracts and grants			85	5,114,871	68	4,628,760	—0—	674,826
l overhead on contracts and grants (15+16)	85	13,339,212	87	(58,845,358)	84	(60,039,757)	—0—	3,293,342
owment income		17,576,918	53	26,227,239	51	28,016,439	—0—	3,163,530
estricted gifts and grants		10,960,387	85	13,771,283	83	14,038,235	—0—	1,163,957
ical college expenses paid by teaching hos- ls and clinics	28	13,727,308	33	31,047,912	37	46,789,800	—0—	11,986,593
e, city, and county grants-in-aid or subsi- paid to medical college	11	7,592,430	6	6,816,009	7	8,265,103	—0—	2,355,538
lical college expenses paid by medical serv- funds	22	10,635,435	33	25,203,185	41	30,247,655	—0—	3,065,449
me from college services (medical labora- , etc.)	45	5,259,981	55	14,112,449	53	15,293,171	—0—	2,498,814
e payments or subsidies paid through com- ts such as WICHE and SREB	11	573,342	7	783,206	8	825,656	—0—	275,000
er income from regular operations		6,501,150	59	15,829,695	67	27,157,669	—0—	3,450,023
cellaneous income (total of items 23, 24, 25)	45	(12,334,473)	79	(30,725,350)	81	(43,276,496)	—0—	3,913,272
te appropriations for defrayal of medical col- expenditures	40	49,778,410	43	111,985,457	47	132,992,088	—0—	7,346,619
cellaneous medical college reserves			3	226,539	6	779,744	—0—	389,140
cellaneous university income and reserves	45	14,477,884	51	22,110,390	49	20,814,148	—0—	2,400,915
al Expenditures for Regular Operating Pro- ms (exclusive of sponsored programs)		**(174,790,735)**	**87**	**(367,977,848)**	**88**	**(429,203,253)**	**1,308,431**	**17,662,899**
al Expenditures		**319,028,651**	**87**	**882,184,162**	**88**	**1,010,327,369**	**2,332,264**	**43,417,130**

* of combined items, total number not computed.

Cf AAMC data

40

Issue Paper: Salary Support for Medical School Faculty

SUMMARY

Phase-out of Federal Support for Faculty Salaries

If a decision were made to phase out Federal support for the salaries of medical school faculty, a careful study would be required to develop a phase-out plan, schedule and regulations to carry out this policy in an orderly way. Probably 5 years would be required to implement the policy fully.

Advantages and Disadvantages

The principal effects of eliminating Federal support for the salaries of medical school faculty would be: (1) to reduce substantially the amount of medical research performed in the medical schools, and--assuming the "released" funds were still to be used for medical research--to shift the locus of medical research to other academic and non-academic institutions; (2) to substantially reduce the number of full-time medical school faculty available both for teaching and service; (3) to make it exceedingly difficult--if not impossible--to establish new medical schools or to expand existing schools; and (4) to run the risk of forcing some existing schools to close. The impact on medical science would be strongly negative. Many projects would be forced to close out, many cooperative research efforts would have to be abandoned before reaching the pay-off stage, attracting promising young scientists to research careers would become more difficult, new research institutional relationships would have to be established to accommodate more medical research outside the medical schools. Although many of the scientists ultimately would move from the medical schools to other institutions where they could continue to do medical research, there would be substantial losses in personnel and research momentum caused by these institutional disruptions which would take many years to overcome.

Another serious disadvantage would be the risk of decoupling medical research from the teaching and service responsibilities of medical school faculty. The current system ensures prompt application of research findings to patient care and their inclusion in the medical education curriculum. Shifting the institutional locus of medical research away from the medical schools will change role relationships seriously and may introduce time lags and communication problems in applying new knowledge.

DHEW is responsible for carrying out clearly articulated national commitments to support biomedical research, to strengthen and expand medical education, and to improve medical service. The medical schools are the principal instrumentality through which the public policy goals in these areas can be achieved. Medical schools are complex, delicately balanced institutions. All have precarious financial arrangements. All are heavily dependent on Federal funding. Full-time faculty in the medical schools are required to carry out all of these functions. Thus any reduction of Federal support for faculty salaries will not only drastically reduce the amount and quality of medical research being performed nationally, but it also will have an immediate and deleterious impact on the education of health professionals--particularly physicians-- and the ability of the medical schools to contribute to improvements in medical service.

There are no offsetting advantages--as measured by impact on the stated goals--of the policy of phasing out Federal support of medical school faculty salaries.

April 30, 1969

ISSUE PAPER: SALARY SUPPORT FOR MEDICAL SCHOOL FACULTY

The Issue

The issue posed by the Assistant Secretary for Planning and Evaluation is as follows:

An average of about 48 percent of full-time faculty in medical schools received all or part of their salary from Federal support. What would be the best way for the Department to phase out such support in an orderly manner, while retaining the released funds for other research purposes? What would be the advantages and disadvantages of phasing out support in terms of the maintenance of a high-quality scientific base? To what research uses would the released funds be put?

Basis for the Present Situation

It is difficult to take the issue as stated seriously. The action proposed would create havoc throughout the complex and delicately balanced system of medical education in the United States and at the same time bring high quality basic research in the biomedical sciences to a near halt. Nor is it clear why this issue would be raised. During the last two decades, there has emerged a deep and clear national commitment to biomedical research as an instrument to achieve plainly articulate public policy objectives. During the last decade, an unequivocal and growing commitment to the support of medical education and, selectively, of medical care, have been added to the list of national goals. The federal establishment has a huge stake in the nation's medical school system, outlined in somewhat greater detail in "Issue Paper: Institutional Stabilization". The DHEW must rely heavily on these schools if it is to achieve the goals mandated to it. Under such circumstances, it would appear completely logical and appropriate for the most vital element in the system, the faculty, to derive substantial support from Federal sources. Faculty members train the students, determine the quality of the educational experience, control the relevance of the curriculum; they set standards for health care and modify them continuously under the influence of new knowledge and insights derived from faculty conducted research; they assume substantial responsibility for faculty expansion (for new schools) and faculty renewal and replacement. The faculty of a medical school is by all odds the most critical component of these institutions. Quality faculties can be built only slowly and with painstaking care. The greatest vulnerability of a medical school in striving to maintain its stature is its faculty. For the DHEW to take an action directed, collectively, at the members of the faculties of the country's medical schools would be as foolish as it would be self-defeating.

Federal Funding in Medical Schools

The best available financial data related to the income of the Nation's schools of medicine is published annually by the American Medical Association's Council on Medical Education. Most of the information relevant to faculty salary support is derived from the AMA-AAMC

liaison questionnaire. Inquiry into the sources of faculty salary support is a recent addition to the survey instrument; both questions and responses are less sharply formulated than one might wish. Figure 1 shows the trends of salary support from Federal grants. Table 1 shows, by Department and academic rank, the percentages of full-time faculty members receiving all or part of their salary from Federal sources.

Supplementary grouped statistics (with names of schools deleted) were supplied to the NIH by the AAMC. Analysis based on 71 schools reveals that:

- The schools reported $289 million total faculty salaries; about 1/3--$93 million--comes from Federal sources (Table 2).

- In 34 schools with Federal support ranging from 30 percent to more than 50 percent of total faculty salaries, the average per school was $2.3 million for the 50 percent and above group, $2.0 million for the 40-49 percent group, and $1.9 million for the 30-39 percent group, as compared with an average Federal faculty support of $1.3 million for all 71 schools. (Table 3).

- In five schools, Federal faculty support ranged from $3 to $5 million and in 11 schools, the range was from $2 to $2.9 million (Table 4).

- In 10 of the 71 schools, Federal support provided more than 50 percent of total faculty salaries; in 41, Federal support accounted for more than one-fourth of the funds allocated to medical school faculties.

Examination of Table 5 indicates that of the sources of income reported by the schools for the academic year 1966-1967 (and it should be noted from the variation in the number of institutions reporting under the several categories that the data may be incomplete), Federal grants and contracts for teaching, training and research together with their overhead account for about 52 percent of the income reported. How much of the income for patient care activities was derived from Federal sources is not specifically identified.

A comprehensive examination of the flow of Federal and especially DHEW funds into the Nation's medical schools, based on a perusal of Federal records is presented in the appended DHEW Obligations to Medical Schools, Fiscal Year 1967. Examination of these data indicate that: the Federal Government has become more and more deeply involved in all levels of medical education and research in recent years, and provides such a large proportion of total support that medical schools would be hard pressed to function at present levels without these funds. In FY 1967 Federal sources accounted for roughly 50 percent of medical school budgets; for FY 1968 the Federal

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1/ See Ernest M. Allen, "Fiscal Relations Between the Medical Schools and the Federal Government," The Journal of Medical Education, Vol. 43, No. 6, June 1968, p. 698.

share has been estimated as high as 75 percent. 1/ With relatively slower increases expected in private and state appropriations, the medical schools will depend even more on Federal support.

Many forces have led to the growing reliance of medical schools on Federal aid, among which may be noted--

- The burgeoning of biomedical science in the postwar years and the development of the NIH research grant program;

- The development of the training grant program;

- The transformaton of the medical school into the medical center designed to cope with a complex of research, teaching, and consultative activities, and--more recently--the assumption by these centers of a direct responsibility for improving the practice of medicine and the delivery of medical care.

DHEW Programs, in particular, have sparked many of the biomedical developments of the postwar period and have pioneered the patterns of support that have permitted the medical research and training endeavors of medical schools to flourish.

The steadily increasing reliance of medical schools on Federal support is reflected in these aggregate statistics:

- Total expenditures. In 1958 Federal funds comprised 30 percent of total medical school expenditures, 54 percent in 1964, an estimated 60 percent in 1967, and perhaps as much as 75 percent in the current fiscal year.

- Faculty support. In 1958, only 2,600 full-time faculty received salary support from Federal sources compared with about 9,500 full-time faculty in 1967. Thus, about 50 percent of all full-time faculty now receive some portion of their salary from Federal funds.

- Construction. The Federal Government accounts for almost 30 percent of all building construction; whereas in prior years Federal funding was restricted to construction of research facilities, in more recent years it has been broadened to include construction of teaching and related facilities as well.

- Sponsored research. Federal sources account for 82 percent of total.

Further discussion of the historical development of these relationships are outlined in the section entitled the "Stake of the DHEW in the Nation's Medical Schools" contained in "Issue Paper: Institutional Stabilization".

Instruments for Federal Support of Medical School Faculty Salaries

Federal funds flow to the medical schools through a number of instrumentalities.

- In certain types of awards, all or part of the salary of a faculty member may be budgeted in an approved application as necessary to carry out the purpose for which an award is proposed. Examples of this include: research grants and contracts; research training grants; comprehensive health planning grants; Regional Medical Planning Grants; and Health Services Planning Grants.

- Institutionally oriented support grants--general research support grants, basic and special improvement grants (soon to be formula and project improvement grants) and institutional allowances connected with scholarship and fellowship awards--go into pools from which faculty salaries are pieced together.

- Research career and research career development awards provide direct significant salary payments to faculty members; "Special" research fellowships frequently subserve an identical function.

- Yet another Federal source for faculty salary support is pooled money derived from Medicare and Medicaid payments.

- Finally, some employees of the Veterans Administration also hold faculty appointments in medical schools, but few of them could be classified as "full time".

The data available to the NIH from either published or unpublished sources are grouped and do not permit fine analysis in terms of the specific components which make up the salaries of individual faculty members. Thus, specific and detailed information does not exist.

Phase-out of Federal Support for Faculty Salaries

The procedures for achieving the goals defined by the Office of the Secretary would seem to be relatively straightforward and simple. Quantitatively, it may be assumed that salary components in the budgets of research grants, training grants, and general research support grants, combined with research career awards are the most significant sources of Federal support. An orderly procedure for reducing these, perhaps on the basis of negotiated agreements with an entire medical school, could be devised on short notice and put into effect by simple changes in operating guidelines. At the end of five years, an absolute ban on the use of these funds for salary support of full time faculty could be in effect. The NIH would presume that a ban on the use of funds from other types of grants and awards for full time faculty salary support could be as easily achieved by the agencies which administer the appropriate programs. However, in some

cases, careful studies to pinpoint the significance and magnitude of the contribution of the Federal program to the salaries of full time faculty members might warrant further study prior to the issuance of a phase-out schedule.

Advantages and Disadvantages

A reduction of about 30% in faculty salary support by the prohibition on the use of Federal funds for this purpose would have a serious impact on medical schools. The action would force a sharp reduction in the salary scales in the medical schools--with the probable loss of faculty to health service occupations outside the medical school--unless an equivalent source of income could be found. It would appear unlikely that any substantial fraction of the needed income increment could be provided from patient care sources since in most medical schools facilities for income producing patient care activities are saturated. Substitutive support for research salary components from non-Federal sources is inconceivable. Perhaps funds justified for teaching purposes could be pried out of, for example, state legislatures. If so, salary levels could be restored but an obligation for expended teaching--not research--activity would be assumed in the process.

The withdrawal of Federal funds from the support of faculty salaries would result in a reduction in faculty performed--and faculty supervised--research by more than the aggregate $93 million identifiable with that category of activity. With no way of funding principal investigators, projects under the aegis of those whose research activities were totally dependant on Federal funding would have to be terminated. Thus, total recovered funds would exceed significantly that of the faculty salary component.

Use of the recovered funds for research within the medical schools would depend on the (unlikely) probability that alternative funds in adequate amounts could be obtained to provide salary support for the research team leaders. Clearly, the outlook for this is severely limited, and the inescapable conclusion is that the research programs in the medical schools would be sharply curtailed. The recovered funds, however, could be committed to research outside medical schools to other academic and non-academic institutions, where, presumably no impediment to supporting principal investigators from Federal funds would exist. Research could move to other health profession schools, to graduate schools, to research institutes, to non-affiliated hospitals, and to industry. In all probability expenditures of funds in the amounts recovered by the proposed action would eventuate in the extensive support of targeted research and technical development, since the basic research capability currently available outside the nation's schools of medicine, is relatively limited.

The effect of those events on the quality of the scientific base for medicine is a matter for speculation. An action of the sort implied would certainly put to the test the hypothesis that the large amounts of money currently available for research divert the nation's most creative people from science into administration, their energies and time consumed in the preparation of research grant applications, and in the training of graduate students, all at the expense of what they do best, research.

ISSUE PAPER: ADVANTAGES OF TRAINING GRANTS

The issue as raised and stated by the Office of the Assistant Secretary for Planning and Evaluation:

> The BoB attempted to make a drastic reduction in training grants in FY 70, an attempt which if successful would have been extremely disruptive. In the Department's effort to maintain a strong and vigorous scientific base, what are the advantages and disadvantages of training grants? If the disadvantages are non-trival, how could the Department phase out training grants over a five-year period, shifting the released funds to other priority research areas? What would be the best redistribution of such funds among predoctoral fellowships, institutional support, competing research projects, special research programs, etc?

Before responding to the specific issue raised, because of the BoB proposal which led to it, it seems proper to discuss a portion of what seems to have been the rationale for such a disruptive proposal. It appears that the BoB proposal to essentially dismantle the NIH training programs emanated, in part, from a basic misunderstanding of the range and scope of NIH training programs. This misunderstanding about the full spectrum of these programs may be related to the fact that the NIH institute training programs have been, together with NIH programs generally, quite properly carried in PPB documents under the general rubic of "Increasing Knowledge". Many could equally well be related to "increasing and improving the health manpower pool", and some to "improving the (organization and) delivery of health services". The fact is that in the last decade and a half the NIH training programs have made possible two critically important developments in American medicine: the establishment of an adequate biomedical science base, and the emergence of a substantial number of high quality medical schools all across the country. Without the science base there could be no progress in medical knowledge. Without the quality medical schools the training of the next generation of doctors able to take advantage of the new knowledge could not be done. The role of the NIH and its importance in establishing a biomedical science base is quite generally recognized. Equally important, but less generally perceived has been the emergence of a substantial number of high quality medical schools made possible through NIH support.* More than any other single factor the creation of strong diversified clinical departments, through training grant support of the whole range of clinical subspecialties and the opportunities these have provided for interdisciplinary enrichment and cooperation has been responsible for the emergence of

* See Impact of Public Health Grant Programs on Medical Research and Education, prepared for use of the Interstate and Foreign Commerce Committee, United States House of Representatives, August, 1964.

these schools. Diffuse general support of institutions could not have accomplished the same development in the same length of time with the level of funds available. Selective support through the training grants has enabled the NIH to identify on a competitive basis for the funds available those institutions, departments and scientific fields that were prepared and capable of moving ahead, given proper support, into new areas of special competence.

The need for establishing a science base and the importance of having done so may to some degree have obscured the fact that this science base and the scientifically trained people who support it has not been produced as an end to itself but as an indispensible and all pervasive means to the end which is the collective mission of the National Institutes of Health: the improvement of the Nation's health. The science base is also the essential ingredient that makes possible the development of all modern clinical capabilities.* An adequate modern department of medicine with competence in cardiology, endocrinology, renal disease, etc., simply cannot be developed without the basic science support of physiology, biochemistry, and other disciplines. Consequently, although NIH support of training in basic science disciplines, largely by NIGMS training grants, currently accounts for only about 35 million of the total 140 million dollar training budget, the product of these grants is the common thread that makes possible the quality of the entire remaining clinical portion of the training spectrum.

The majority of the NIH training budget is devoted to the support of training in clinical departments of medical schools. This is the backbone for the maintenance of excellence in American clinical medicine. It has also been the source of development of additional centers of excellence over the past decade. Without funds, and the impetus that the training grant mechanism has provided, the steady improvement of quality in teaching capability that has taken place in medical schools and their associated medical centers in this period would cease and the well-spring of medical knowledge that has inspired the rising expectations for improved medical care everywhere would dry up at the source. The present NIH use of the training grant as the preeminent device for its training program needs has emerged from the historical demonstration of its many advantages. These may be grouped as: 1) advantages for the NIH and its mission; 2) advantages for the grantee (usually a medical school or university); 3) advantages for the trainee; and 4) advantages for the discipline or subspecialty.

I. Advantages for NIH and Awarding Components

1. Flexibility and utility as an instrument for influencing the character of training.

The ability to provide within a single grant a relatively stable source of funds for trainee support together with funds for other purposes

* The Coggeshall Report in 1965, "Planning for Medical Progress Through Education".

such as needed faculty salaries, equipment, supplies, and other necessities in order to upgrade the department's or institution's training capability to the level adequate for proper training in the specialty or discipline, taking into consideration elements such as the opportunities for interdisciplinary efforts and cooperation, availability of basic science capability in clinical specialties, institutional commitment to the programs' effort, credibility of performance estimates---all of this as subjected to peer review---exists within the training grant mechanism to a degree attainable in no other way.

2. Adaptability to changing program needs.

Many of the same characteristics that provide the flexibility and usefulness as listed above are equally important for a ready responsiveness and adaptation to meet the requirements of change.

3. The control of quality.

Again, the availability to those responsible for programs, within a single instrument, of funds for both trainee and institution for a common purpose, subject not only to an initial quality review but to periodic continuing review in terms of both accomplishments and relative to goals as initially projected, provides a unique capability for quality control.

4. The ability to initiate new programs responsive to national need.

The unique ability to combine within a single instrument a variety of kinds of support, and to control the direction of this makes it possible, once any kind of program decision has been made by the agency, to proceed with the initiation of any new program, and if funds are available, it is possible to do so.

5. Breadth of scope.

The flexibility of the training grant instrument makes possible the initiation and support of programs of almost any conceivable size and scope ranging from a small program at a handful of institutions with only a few trainees to meet a specific need, to a vast program on a national scale that will eventually enroll hundreds of trainees.

6. Measurement of output.

Although assessment of accomplishments in terms of throughput of trained individuals related to program objectives is difficult in any field where the training may cover many years and a number of institutions, it is more susceptible to quantification on training grants that it is with other methods of support. The effect of broad institutional support is virtually impossible to measure in relation to specific program goals.

7. Efficiency.

Particularly with regard to the most efficient use of present critically short space and personnel in existing departments and institutions the manner in which the training grant mechanism places the management responsibility directly on the performer makes it advantageous for both the NIH and the recipient institution. The selection of trainees is not left to chance; control and options are at the local department level, and there is a significant opportunity for department initiative.

II. Advantages to Institutions

1. The opportunity to tailor programs to meet institutional capabilities and requirements.

The same kinds of flexibility inherent in the training grant device that are so advantageous to the awarding agency make it possible for an institution in applying for a training grant to take full advantage of their inherent strengths while at the same time requesting funds to shore up institutional or departmental weaknesses or to meet program needs.

2. The ability to strengthen departments.

Many institutions that would be perfectly willing to undertake the training of additional persons in various disciplines or specialties would be unable to do so unless they could simultaneously obtain an increment in faculties or other facilities.

3. Ability to stablize the institutional training setting.

The stable commitment of funds, usually for a five-year period, which insures support both of a defined number of students or trainees with a definite increment of department support confers an important measure of stability within the department that could not be obtained even if equivalent monies were presumably available in separate pockets.

III. Advantages to Trainees

1. The advantages to trainees are generally in comparison with the situation that might obtain if support were being obtained from other sources such as fellowships, scholarships, or employment on a research grant. The NIH experience has shown that when the trainees have an option among forms of support that they will almost invariably choose the training grant stipend. This is particularly important for pre-doctoral trainees entering a program, because it means that gaining admission to a doctoral training program in a university carries with it a stipend, and gaining admission to the university graduate school and to the departmental program can be carried out as a single coordinated application. Obtaining fellowship support at the same time requires negotiating a second competitive hurdle simultaneously.

2. A better training experience can be obtained within an organized program which covers the breadth of appropriate research areas, methodology, instrumentations, analytic techniques, within a formally structured, broadly based, planned research training program, than could be accomplished in an on-the-job training basis within a research grant employment which cannot accommodate to the trainee's needs.

3. For predoctoral trainees the time required to obtain graduate training for a graduate degree is greatly shortened over what is required when the training is obtained as an incidental to employment on a research grant.

IV. Advantages to Disciplines or Specialties

Both basic science disciplines and clinical specialty fields have discovered the usefulness of the training grant mechanism for upgrading the quality of training in their fields and for the targeted relief of critical shortages of manpower within those fields. Shortages of funds, for the last two fiscal years particularly, have, for example, seriously hampered efforts within such specialities as orthopedic surgery to improve training within this field.*

Disadvantages of Training Grants

From the standpoint of the NIH and its awarding units the training grant mechanism has no significant disadvantages.

Disadvantage to Grantee Institution

The only real institutional disadvantage sometimes related to the training grant mechanism is that in those instances where a university has permitted one or more training grants to become essentially the sole source of department support, the non-renewal of such a grant either because of failure in competition or unavailability of funds, can pose extremely serious problems for the viability of such a department. This is an indictment, however, not of the training grant mechanism nor its capabilities, but of the critical lack of solid, broad institutional support which had led university administrators in some instances to depend on training grant funds for a breadth of department support which they were never intended to provide.

Disadvantages to Trainees

This is really a matter not of disadvantage but of preference. In the event that a trainee might prefer, for reasons of independence or prestige, to seek support through the fellowship route, he is free to do so.

* A study by the American Academy of Orthopedic Surgeons was recently critical of the NIH for failure to adequately support this field.

With particular regard to the question of substituting institutional support for training grants it must be recognized that these are generally complementary and additive, not substititive mechanisms, that differ particularly in these ways:

1. In the case of general institutional support:

a. Funds are simply awarded to the institutions, and the Federal Government cannot actively develop programs to meet specific, long-range plans.

b. The NIH goals of training outstanding scientists and clinical investigators in selected fields needed for academic medicine and research are confused with broader, long-range goals related to the economic stability of institutions _per se_, the assurance of which would require a rapidly accelerating level of support far in excess of funds currently available. Because of the strategic importance of academic and research manpower for the expansion of the Nation's medical schools, the future for development of important new areas of research; it is vital that the Nation's capability for training essential academic and research manpower be maintained and not be lost in the need for overall institutional support.

2. In contrast to this, the training grant mechanism:

a. Decentralizes trainee selection to the institutions, departments and individuals responsible for developing the training program and places responsibilty for program objectives squarely on the performer, _not_ the institution as a _whole_.

b. Enables NIH staff, in consultation with leading scientists and academic physicians, to select those institutions, departments, and individuals who can best guide the training of academic scientists and physicians, and who are most able to develop new areas of biomedical research. Only through the training grant can the NIH appropriately modify and shape its programs. NIH is a health agency using science to obtain its goals. As a health agency, goals can be met more effectively through training and research grants with specific program objectives, while general support can be more easily met through institutional support programs.

In view of the foregoing it becomes clear that in responding to the issue raised, since the advantages of training grants are substantial and the disadvantages are quite minor, a detailed response to the question posed if the reverse were true, as to how the department could phase out the training grants over a five-year period, should not be made in substantial detail. It is also important to recognize, relative to the way the question is phrased with regard to "the best redistribution of funds among _predoctoral fellowships_, institutional support, competing research projects, special research programs, etc.", that as we have

indicated, only about 35 million dollars of the total NIH training budget is devoted to predoctoral training grants. The balance is devoted to postdoctoral training principally in the clinical departments of medical schools and to fellowships. It is clear even if training grants were to be phased out over a five-year period, that the effects would still be enormously disruptive of university and medical schools programs and would have to be assessed on an institution by institution, almost department by department basis. This disruption would affect: 1) the continuing development and support of a more adequate science base; 2) the development of additional crucially needed centers of excellence; 3) the depletion of the critically small number of leaders now being trained for key faculty positions; 4) the development of the large number of additional clinical specialists that the increasing complexity of our medical knowledge and technology will require for patient care; 5) the support of institutions on a selective departmental basis in order to support areas of special competence as they emerge in institutions. There is probably no way that the impact of phasing out training grants could be ameliorated with regard to most of these effects. Some of the things now being accomplished through the training grant mechanism could, of course, also be done by combinations of other kinds of support; but only if equivalent department support were then made available through some other mechanism similar to the general research support grants, and the stipends were picked up by traineeship awards that carried a block of stipends. The complexity and unit cost of administering programs entirely composed of individual fellowships, the narrowness of the training capability, and the increased length of time necessary to obtain training via research grant employment, reduce the attractiveness of these methods of support, and it must be emphasized again that any such combination of devices would not give the same flexibility as the training grant mechanism now does. With particular regard to support of training on research grants, some of which of course could be done and is being done, one must recognize that this is an instrument of limited scope and flexibility for training purposes. Employees on a research grant are paid for services rendered, not for the training they are receiving, which is essentially incidental. Consequently, the time available either to do necessary course work or to obtain skills other than those within the generally narrow scope of the project is very limited. Moreover, the usefulness of this mechanism is almost wholly limited to the area of the predoctoral Ph.D. candidate.

Summary

In summary then, the emergence of the training grant as the preeminent mechanism for support of NIH training programs, for the development and vigorous support of the necessary science base and for the development of the necessary clinical competency to deal with the complexities of modern medicine has been through the historical demonstration of its effectiveness. To ignore this historical lesson by regressing to methods of support that have been demonstrably less effective, would be a failure to discharge the public trust for the

expenditure of monies that have been appropriated by the Congress to permit the discharge of the training responsibilities of the NIH and in the exercise of responsible judgment for the procurement of the essential fully trained medical manpower needed to meet the needs of our citizens in the years ahead.

HEALTH TASK FORCE

Objective Area: INCREASING KNOWLEDGE

OVERALL SUMMARY

I. Goals

The overall goal is the development and dissemination of basic knowledge leading to prevention, control, amelioration and cure of physical and mental disorders with a view to improving the quality of human life as well as lengthening its span.

II. Objectives

Support and expand the national health research enterprise at levels that constitute a reasonable fraction of total national health expenditures because the outputs affect both the quality and costs of health manpower and the health service system. Provide sufficient support to permit rapid growth of research in areas of special interest and importance in response to specific opportunities, as well as sustain a broadening base of biomedical research and research training and associated activities to facilitate communication of biomedical information and to provide necessary research facilities.

II. Approximation of Objectives to Needs

"Needs" cannot be clearly defined when dealing with research programs. The concept of "level of effort" is more appropriate. The Realistic Levels projected for the several programs in the area of "Increasing Knowledge" are estimated (1) to support levels of effort that will employ the talented scientific manpower available to address significant health research problems; (2) to train scientific manpower to meet national needs for faculty in the health professional schools and the health science departments of other academic institutions as well as to supply the manpower needs for the non-academic health research community in the late 1970's and 1980's; (3) to provide sufficient health research facilities to accomodate the projected levels of health research and research training by 1980; and (4) to support the development of systems and facilities based on innovative technologies designed to deal more effectively with the problems of acquisition, storage and retrieval of biomedical information.

IV. Dollars

See Appendix III (attached).

V. Legislation

Three legislative actions are needed:

A. Extension of the research contract authority (Section 301(h) of the PHS Act) which expires June 30, 1971.

B. Extension and amendment of Title VII A of the PHS Act which authorizes the HRF program.

C. Extension and some modification of authorities contained in Medical Library Assistance Act, Sec. 393-399 of Title III, Part I of the PHS Act, which expires June 30, 1970.

HEALTH PLANNING TEAM - INCREASING KNOWLEDGE

PROGRAM REPORT AND PLAN ON EXTRAMURAL RESEARCH

PART I

National Institutes of Health Extramural Research Program

May 1, 1969

ERRATA

The tables on pages 57-62 inclusive are incomplete. The correct tables appear in Appendix III of the Chairman's Report.

SUMMARY

PROGRAM REPORT AND PLAN ON EXTRAMURAL RESEARCH:

PART I.

I. *The Goal*

The primary goal is improving the health and well being of the American people. The effort toward this goal is not limited to modulating the course of dread diseases but to improving the quality of life through prevention and eradication of disease and through particular attention to social trends and developments which influence health.

II. *Objectives*

There are two primary objectives:

. . . To advance the understanding of biological and behavioral phenomena underlying health, disability and disease (developing the base of science); and

. . . To advance the Nation's capability for the maintenance of health and for the diagnosis, treatment and prevention of diseases (developing and maintaining the system for the generation of new knowledge.

Revolutionary progress in the biological and medical sciences remains critically dependent upon the advance of fundamental knowledge and the development of broad and enlightening theoretical concepts. Major advances emerge largely in an unpredictable manner. Thus the opportunities for undertaking large, organized research programs directed toward specific goals remain relatively fewer in number and relatively limited in scope.

Despite this limiting circumstance, biomedical research has always had, and will have in the future, a large proportion of practical and problem-oriented activity. There is, therefore, a subset of clearly identifiable objectives related to the cure of cancer and heart disease, the prevention of mental retardation, etc.

The ability to address the pressing problems of health requires a system or network of individuals and facilities sufficient to exploit the scientific opportunities available.

III. *Approximation of Objectives to Needs*

It is recognized that the results of research cannot be quantified in terms of production units. We rely upon a best professional judgment on the relevance of the research and the chances of its success in achieving an output of new knowledge which leads to the solution of the problem under study. The processes of making the overall and long-range determinations, and even the more specific selections, are complex, are not amenable to simple cost-benefit or cost effectiveness analysis, but must, for the foreseeable future, be dependent upon judgmental decisions of a most sophisticated kind. Therefore, we proceed to establish--through the aggregate of the activities--a national system or network of institutions and individuals to engage in the essential research. The basic questions are how best to support the system and at what level, and what are the constraints on growth--dollars, people, facilities, ideas and opportunities on the one hand; on the other, what is the magnitude of problem likely to be helped--cancer, heart disease, mental retardation--all big problems, requiring big investments. The crucial exercise is *to match the availability of ideas to the seriousness of the problems and the dollars which can be made available.*

IV. *Dollars*

An average annual growth rate of 16 percent for NIH support of research grants and 20.4 percent for General Research Support Grants is proposed for 1971 to 1975 as the realistic plan. This rate would provide the increase necessary to cover the probable increases in prices and wages, the increased cost of highly advanced complex technology, and the addition of new areas of scientific investigation and new young scientists.

If resources are not available, and it is necessary to maintain program coverage at a constant 1970 level, then the net result will be a cutback in output. The only adjustments which have been made in the projection were those considered absolutely essential to cover the 7 to 8 percent increases in prices of materials used in performing research. This would be insufficient to cover increases in salaries needed to attract and retain quality employees, to offset increasing costs in certain disciplines requiring constantly more elaborate and expensive equipment; no new investigators and no opportunity to invest in new, possibly high-risk, but big payoff areas.

Realistic Plan
(in millions of dollars)

	1970	1971	1972	1973	1974	1975
Research Grants	$572	$685	$815	$933	$1,074	$1,239
General Research Support Grants	61	100	125	155	182	210

Alternative Plan
(in millions of dollars)

	1970	1971	1972	1973	1974	1975
Research Grants	$572	$612	$655	$701	$750	$803
General Research Support Grants	61	65	70	75	80	86

V. *Legislation*

The research contract authority in the Public Health Service Act (Section 301(h)) will expire June 30, 1971 and should be extended.

VI. *Administrative Changes*

None.

I. PROGRAM BACKGROUND

A. Program Objectives

1. What are the program objectives?

The Extramural Research Program has two primary objectives in support of the national goal of improving the health and well-being of the American People:

. . . To advance the understanding of biological and behavioral phenomena underlying health, disability and disease (developing the base of science); and

. . . To advance the Nation's capability for the maintenance of health and for the diagnosis, treatment and prevention of diseases (developing and maintaining the system for the generation of new knowledge).

An overriding circumstance which has exerted a dominant influence on scientific activity relevant to health and medicine, is that there is no general, unified body of knowledge and theory encompassing the phenomena of life and the nature of disease and health such as obtains in the physical sciences. Revolutionary progress in the biological and medical sciences remains critically dependent upon the advance of fundamental knowledge and the development of broad and enlightening theoretical concepts. Meanwhile, current research efforts directed toward particular health problems have a high element of empiricism and are surrounded by critical uncertainties. Major advances, therefore, emerge largely in an unpredictable and uncontrollable manner. Thus the opportunities for undertaking large, organized research programs directed toward specific goals remain relatively fewer in number and more limited in scope than, for example, in the physical sciences and engineering.

Despite this limiting circumstance, biomedical research has always had, and will have in the future, a large proportion of practical and problem-oriented activity. This is due to the intrinsic character of the medical sciences, pervaded as they are by a concern for achieving mastery over the untoward conditions and hazards of human life.

The phenomena of life and disease have engaged scientific thought since the beginning of rational inquiry, and their study has always been characterized by a mixture of the fundamental and the practical. No other field of science has faced more insistent demands for immediate and practical contributions. And none has made such frequent and valuable contributions to the alleviation of distress and the betterment of human existence.

The inadequate state of knowledge underlying human health and disease led the initial emphasis to be directed, on as broad a scale as resources would permit, to advancing the base of science upon which progress in the major problem areas is entirely dependent.

Beyond the building of this base, the clear requirements of our disease and health-oriented mission have imposed the need to--

- stimulate the direction of scientific interest toward new areas of inquiry, and new problems and opportunities directly bearing upon the categorical disease problems;
- direct penetrating inquiry into the shifting patterns of disease, disability, and the factors affecting health as they emerge in the changing conditions of human life;
- exploit the advances in biomedical knowledge, the physical sciences, and engineering through deliberately organized research programs directed toward disease or problem areas of urgent need and high probability of pay-off.

The ability to address the pressing problems of health requires a system or network of manpower and facilities (performers) sufficient to exploit the scientific opportunities available.

Within these broad objectives, it is possible to identify a more specific level of actual biological and disease problems which are the targets of the NIH research effort. These can be categorized according to the various Institute and Division programs and brief examples are given in Appendix A, Specific Objectives.

2. *Brief summary of authorizing legislation language, interpretation, expiration date and authorization levels.*

The National Institutes of Health and the National Institute of Mental Health operate under several public laws. The primary authority for the Institutes and Divisions was established in Section 301 of the

of the *Public Health Service Act of 1944* (as amended), which states that

> *"The Surgeon General shall conduct in the Service and encourage, cooperate with, and render assistance to other appropriate public authorities, scientific institutions, and scientists in the conduct of, and promote the coordination of, research, investigations, experiments, demonstrations, and studies relating to the causes, diagnosis, treatment, control, and prevention of physical and mental diseases and impairments of man, including water purification, sewage treatment, and pollution of lakes and streams. . . ."*

Part D of this Section authorizes the establishment of the extramural program at the National Institutes of Health. It authorizes NIH to:

1) *"Make grants-in-aid to universities, hospitals, laboratories, and other public or private institutions, and to individuals for . . . research or research training projects . . . grants-in-aid to public or nonprofit universities, hospitals, laboratories, and other institutions for the general support of their research and research training programs as are recommended by the appropriate National Advisory Council. (This authorizing statute does not prescribe any level of authorization or any date of expiration.) and* (2) *to "enter into contracts...including contracts for research...." (This authority will expire on June 30, 1971; there is no authorization level prescribed in Section 301(h).)*

Title IV of the *Public Health Service Act* gives specific authorization for various research Institutes. It allows the establishment of *"one or more additional institutes to conduct and support scientific research and professional training . . . (for any) other particular diseases or groups of diseases . . ."* at the discretion of the Surgeon General and Secretary of DHEW.

3. *Quantification of outputs and how levels of last three years.*

It is recognized that the results of research cannot be quantified in terms of production units, but if achievements and accomplishments can be interpreted as "outpus," qualitative bench marks can be identified and some examples given which do show measurable benefits. There should be no attempt, however, to translate the overall effort in such terms, however, as it gives a misleading impression that the research program can be categorized in terms of measurable and immediate cause and effect; whereas we should make every effort to gain wide acceptance of the fact that the eventual outcome and application of much of the research cannot be accurately predicted in the short or medium range time frame.

With this caveat, some of the clearly recognizable accomplishments (outputs) are described in Appendix B. These activities are categorized by the categorical Institutes or Divisions which are in large measure oriented toward groups of diseases.

While these do not represent an exhaustive listing of accomplishments, they are illustrative of the type of practical achievements whose impact, if not quantifiable precisely, can be readily appreciated. Actually, a number of such advances have been studied to determine such things as the decline in absence from work, the salvaging of the wage earner for a productive life for a number of years, savings in costs of therapy and hospitalization with the result that probably only a few such accomplishments need to take place annually to provide substantial benefits and offset research expenditures for a comparable period.

A further dimension of program achievements relates to the objective of developing and maintaining "the system" for research. General Research Support Grants and health research facilities construction are particularly relevant here.

The traditional General Research Support Grant provides support of a general, flexible nature designed to improve the overall quality of health related research and research training in recipient institutions. Within broad guidelines, the institutions themselves program the funds, thus encouraging the most effective and rapid development of institutional research capability. A large part of the funds have been used to support new and pilot research projects. In FY 1969, the program expects to make 330 awards to 194 academic and 136 non-academic research institutions. A description of the various other specific program objectives and programs related to the development and strengthening of institutions in the area of their research capability is included in Appendix A under the Division of Research Resources, BEMT, NIH.

4. *Relate objectives with PPB Program Structure.*

The primary PPB Program Categories in the 1969 program structure reflect, in a one-to-one correspondence, the major categories of objectives of the NIH programs. The extramural research programs contribute to the achievement of the goal of increasing health knowledge, a national health resource whose development is essential to the improvement of the health of the American people.

The major disease areas, in which scientific investigation is supported, have been separately identified (e.g., Cancer, Heart, Arthritis) within the rubric of increasing health knowledge. Further distinction has been made between basic(or regular) and special emphasis programs. The basic programs constitute the bulk of NIH research programs, provide the essential framework for the pursuit of the scientific investigations and make possible the identification of programs which may be specially emphasized. The special emphasis programs are those areas within the total NIH research effort, which have been identified as providing significant opportunities for scientific and social benefit, with a high likelihood of success. The list of special emphasis programs includes, for example, the Virus Etiology program of the Cancer Institute, the Sudden Cardiac Death program, a significant program of the Heart Institute, and the Reproduction and Population Research programs of the National Institute of Child Health and Human Development.

A detailed list of the PPB Program Structure follows.

PROGRAM CATEGORY STRUCTURE

Code	Categories
2 _ _ _ _ _	HEALTH
2 1 _ _ _ _	DEVELOPMENT OF HEALTH RESOURCES
2 1 1 _ _ _	Increasing Knowledge
2 1 1 1 _ _	Cancer
2 1 1 1 1 0	Basic Programs
2 1 1 1 2 _	Special Emphasis Programs
2 1 1 1 2 1	Cancer Therapy
2 1 1 1 2 2	Virus Etiology
2 1 1 1 2 3	Other Cancer Etiology
2 1 1 1 2 4	Cancer Task Forces
2 1 1 1 2 5	Special Centers
2 1 1 2 _ _	Heart Disease
2 1 1 2 1 0	Basic Programs
2 1 1 2 2 _	Special Emphasis Programs
2 1 1 2 2 1	Sudden Cardiac Death
2 1 1 2 2 2	Respiratory Diseases
2 1 1 2 2 3	Thrombosis and Hemorrhagic Diseases
2 1 1 2 2 4	Blood Processing and Distribution
2 1 1 2 2 5	Artificial Heart-Myocardial Infarction
2 1 1 3 _ _	Allergic and Infectious Diseases
2 1 1 3 1 0	Basic Programs
2 1 1 3 2 _	Special Emphasis Programs
2 1 1 3 2 1	Transplantation and Related Immunology
2 1 1 3 2 2	Vaccine Development
2 1 1 3 2 3	Interferon and Other Antiviral Substances
2 1 1 3 2 4	Regional Disease Problems
2 1 1 3 2 5	Chronic and Degenerative Diseases of Microbial Origin
2 1 1 3 2 6	Allergic and Immunologic Diseases

Code	Categories
2 1 1 _ _ _	Increasing Knowledge (continued)
2 1 1 4 _ _	Arthritis and Metabolic Diseases
2 1 1 4 1 0	Basic Programs
2 1 1 4 2 _	Special Emphasis Programs
2 1 1 4 2 1	Artificial Kidney
2 1 1 4 2 2	Hormone Development
2 1 1 4 2 3	Organ Banking and Preservation
2 1 1 5 _ _	Child Health and Human Development
2 1 1 5 1 0	Basic Programs
2 1 1 5 2 _	Special Emphasis Programs
2 1 1 5 2 1	Reproduction and Population Research
2 1 1 5 2 2	Perinatal Biology and Infant Survival
2 1 1 5 2 3	Growth and Development
2 1 1 5 2 4	Aging
2 1 1 5 2 5	Mental Retardation
2 1 1 6 _ _	Dental Disease
2 1 1 6 1 0	Basic Programs
2 1 1 6 2 _	Special Emphasis Programs
2 1 1 6 2 1	Dental Caries Task Force
2 1 1 6 2 2	Adhesive Restorative Materials
2 1 1 6 2 3	Dental Research Institutes
2 1 1 7 _ _	Environmental Health Problems
2 1 1 7 1 0	Basic Programs
2 1 1 7 2 _	Special Emphasis Programs
2 1 1 7 2 1	Environmental Health Science Institutes
2 1 1 8 _ _	General Medical Problems
2 1 1 8 1 0	Basic Programs
2 1 1 8 2 0	Special Emphasis Programs
2 1 1 8 2 1	Pharmacology-Toxicology
2 1 1 8 2 2	Trauma
2 1 1 8 2 3	Automated Clinical Laboratories and Other Biomedical Engineering Programs
2 1 1 8 2 4	Anesthesiology and Diagnostic Radiology Programs
2 1 1 8 2 5	Specialized Postdoctoral Research Training
2 1 1 8 2 6	Predoctoral Training Programs

Code	Categories
211___	Increasing Knowledge (continued)
2119__	Neurological Diseases and Blindness
211910	Basic Programs
21192_	Special Emphasis Programs
211921	Perinatal Project
211922	Stroke
211923	Injury of the Central Nervous System
211924	Stimulation of the Central Nervous System
211925	Epilepsy
211926	Inflammations of the Brain
211927	Parkinsonism
211928	Eye Diseases
211A__	Mental Health and Illness
211A10	Basic Programs
211A2_	Special Emphasis Programs
211A21	Affective Disorders
211A22	Biological Factors in Behavior
211A23	Brain Disorders
211A24	Psychoneurotic Disorders
211A25	Psychophysiologic Disorders
211A26	Other Character and Personality Disorders
211A27	Schizophrenia
211A28	Other Psychoses
211A29	Psychopharmacology
211B00	Biologics
211C__	Research Facilities and Resources
211C10	Basic Programs
211C2_	Special Emphasis Programs
211C22	Improving Stability of Academic Institutions
~~211C23~~	Health Research Facilities
211C24	Special Research Resources
211C25	Primate Centers
211C26	General Clinical Research Centers
211C27	Animal Resources
	Computer Resources
211D00	Other Unallocated Research and Support

5. *In what respects does the program attempt to prevent social problems rather than treat them and how can its preventive impact be increased?*

In a sense, the whole effort toward increasing knowledge is directed to preventing social and economic problems by seeking the means of the prevention of acute and chronic illness and disability. There are, in addition, studies of the social consequences of certain biological, as well as clearly pathological developments which lead to further investigative work which will "feed back" to modulate the social problems. The work on family planning, mental retardation, and aging can be cited as examples of the latter category.

Among the millions of Americans who are poor, the problems of inadequate nutrition, family instability, high infant mortality, debilitating illness, and a shortened life span are similar to those experienced by many people in the developing countries. Although surveys indicate that our American poor aspire to small families, they have limited access to family planning services. If these aspirations for small families were met, parents could better insure that their children were not exposed to poverty and that the living standard was adequate for those born out of choice rather than chance.

It is the position of the Federal Government that every child deserves to be wanted; that family ties should be strengthened; that every American family should have family planning information and services available in order to have the freedom to choose or not to choose a method suitable for its needs.

Some of the more significant advances in mental retardation relate to the discovery of biologic causative agents. Increasingly, we have become aware of discrete inborn errors of metabolism, such as phenylketonuria and galactosemia, though these conditions are relatively rare as specific genetic factors. More than a score of similar disorders affecting cerebral function have also been identified. These findings have stimulated further investigation in biochemistry and in population and behavior genetics. Even in genetic defects, however, the social millieu in which the child is reared may have extremely important implications for his development. Longitudinal studies considering these factors are in process.

Education and training techniques presently in use with retarded individuals are only moderately successful. Partly, this stems from our limited knowledge of the physiological as well as psychological bases for learning and development. Through neurochemical studies, we may learn more about how memories are acquired, stored, retrieved, and utilized.

Departments of obstetrics and gynecology are actively engaged in basic research and clinical studies to develop techniques that may ultimately reduce the incidence of prematurity and consequently mental retardation. The large majority of the retarded--approximately 75 percent--are victims of the adverse social heritage into which they are born.

While the conditions described are known to be detrimental to optimal growth of children, the large majority of the culturally and economically impoverished do not become retarded. Further, those who do are usually not identified until school age. This poses a number of interesting research questions. To what extent do polygenic models of intelligence account for retardation in deprived groups? What skills are measured in early childhood and how are they related to intelligence and later development? Are the effects of deprivation on intellectual growth cumulative, and at what age and by what methods can the impact of these forces be reversed? Increasingly, investigators are addressing themselves to these fundamental issues. Their resolution bears directly on present and future services for the retarded.

The life span and the vigor of the later years is limited not only by disease processes but also by the biological changes that occur with increasing age. Studies of the aging process have been made at levels of complexity from that of the entire organism to that of molecular structure. These basic biological studies are essential to an understanding and, therefore, an ability to cope with the social problems of aging as an expanding segment of our population grows older and less vigorous in a society which is oriented to youthfulness. On the behavioral level, the problems are to understand how the individual, as he moves through time, adapts to the situation in which he finds himself, with the capacities he has available; and to determine how personal well-being and value to society can be maximized.

Many other examples could be given but in general, the preventive impact can be enhanced by (1) adequate funding of the research opportunities which are available; (2) thorough exploitation of research findings and scientific advances through the widest possible application; and (3) continued education of the public to take advantage of measures and services which are available to them. These latter two, as well as the first, require adequate funding, which means substantial outlays.

B. Program Operations

1. *What is the basic rationale for Federal Government action in this area?*

Our expanding income and education have generated a rise in our health standards and an increase in our demand for health services. As reflected in national expenditures, our consumption of health services and products more than quadrupled over the past two decades to almost $53 billion in 1968. This exceeds the rates of growth of the population, the Gross National Product, and the prices of units of health care.

The concept of health as a public good has been translated into an expanding proportion of the health expenditures which are supported by the Federal Government, and a broadened scope of Federal programs. Federal interest has been enlarged to include extensive programs of support of research on health and disease, the study of medical care systems, the support of community health centers and regional medical programs, and broad coverage of the costs of health care of the aged and medically indigent.

The Federal role is most prominent in the development of health resources, that area which represents the Nation's investment for health. The reasons for the dominating Federal position in health resource development are suggested by the reasons for the growth of Federal support programs in medical research.

The basic rationale for Federal action relates to the fact that national goals in advancing scientific knowledge may be achieved only at great costs; the risk of failure is considerable; and the high levels of expenditures must be sustained over long periods of time before payoffs are gained. The gains from progress in our understanding of health and disease also should be universally available.

Significant scientific breakthroughs are to be anticipated in the near to middle range future. This fortunate prospect is coupled with the unhappy situation that the rising demand for medical care services, the mounting health costs, and the shortage of qualified manpower have created a critical need for the improvement in the productivity of health services, which only progress in science based areas can modify. This requires a sustained and vigorously advocated effort in research.

Accordingly, the demand for an even more productive biomedical research effort has been intensified. At the present time, National support for medical and health related research equals 4.7 percent of national health and medical care expenditures. Federal support of health research equals 3 percent of total national health expenditures and the NIH support of medical and health related research equals only 1.6 percent of the total national health expenditures.

Table 1.

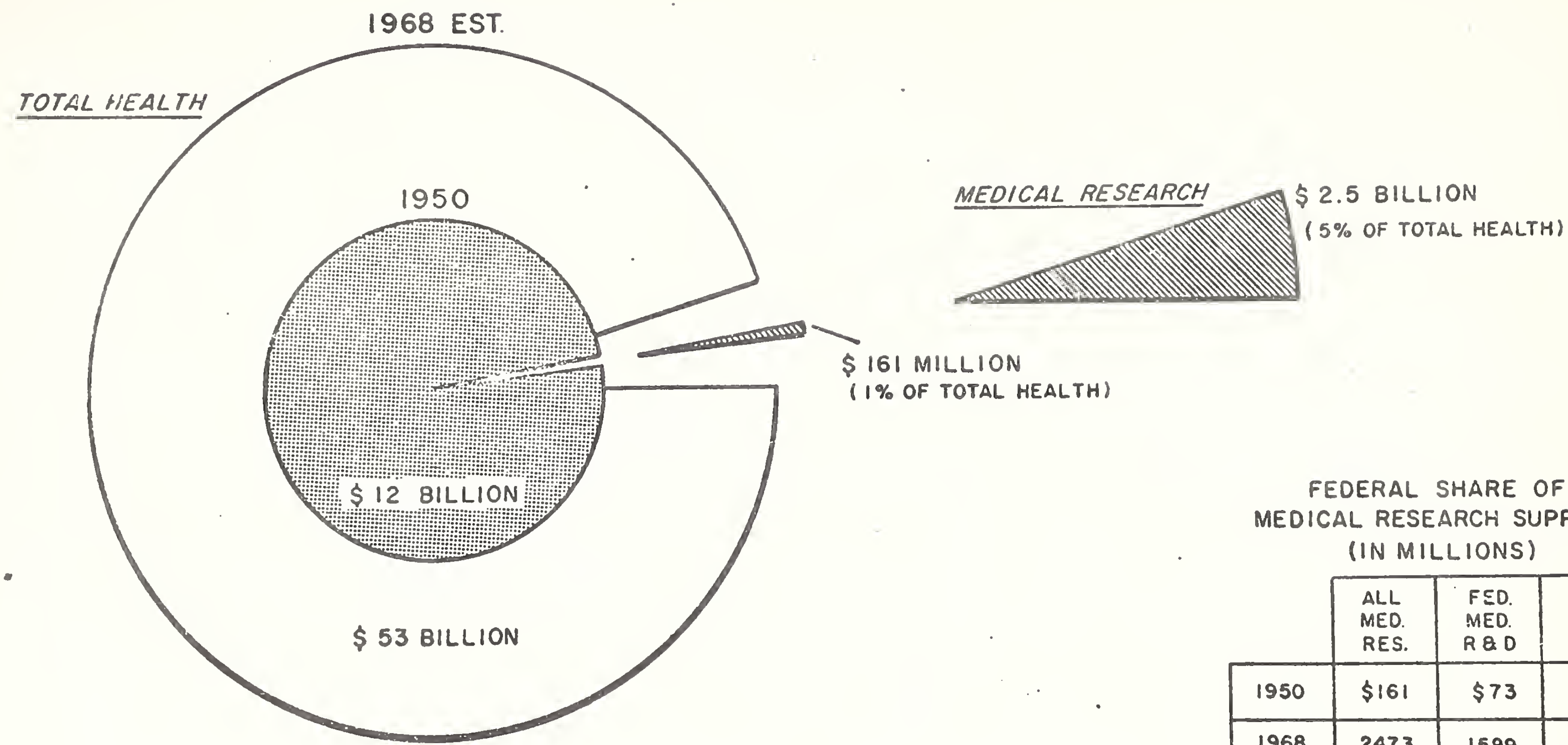
National and Federal Government Expenditures for Health and Medical Care, and Support of Medical and Health-Related Research, Selected Years

	Fiscal Years			
	1950	1960	1965	1968
National health & medical care Expenditures (millions)	$12,130	$26,367	$38,901	$53,122
National support for medical & health related research 1/ (millions)	161	845	1,841	2,473
Percent of national health & medical care expenditures	1.3%	3.2%	4.7%	4.7%
Federal support of medical & health related research 1/ (millions)	73	448	1,174	1,589
Percent of national health & medical care expenditures	.6%	1.7%	3.0%	3.0%
NIH support of medical & health related research (millions)	28	281	715	864
Percent of national health & medical care expenditures	.2%	1.1%	1.8%	1.6%
Percent of national support of medical & health related research	17.4%	33.3%	38.8%	34.9%
Percent of Federal support of medical & health related research	38.4%	62.7%	60.9%	54.4% 2/

1/ Represents obligations.
2/ Excludes NIMH.

Sources: National and Federal Health and Medical Care Expenditures - Social Security Administration.
National, Federal, and NIH Support of Medical and Health Related Research - NIH.

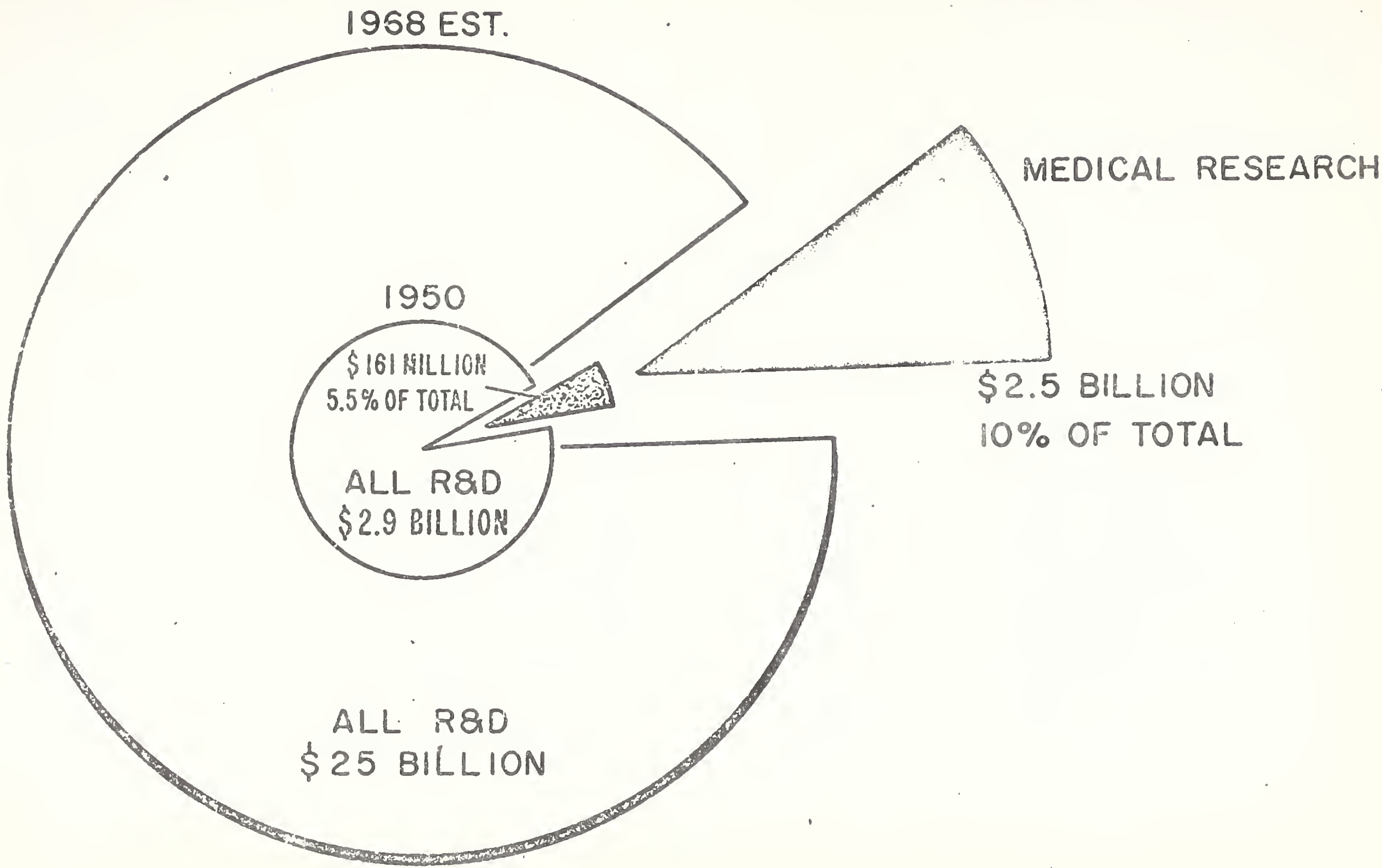
MEDICAL RESEARCH AS A PROPORTION OF THE NATION'S HEALTH COST
1950–1968



FEDERAL SHARE OF
MEDICAL RESEARCH SUPPORT
(IN MILLIONS)

	ALL MED. RES.	FED. MED. R & D	%
1950	$161	$73	45
1968	2473	1589	64

MEDICAL RESEARCH AS A PROPORTION OF ALL RESEARCH AND DEVELOPMENT 1950–1968



The Federal Government has a unique role in contributing to the health and vigor of the academic institutions which provide the locus, manpower and direction of much biomedical research, obviously essential to the accomplishment of Federal research goals and to a number of other national objectives as well. The future of many of these establishments, particularly of the medical schools, is in jeopardy unless comprehensive plans are instituted to protect those which already possess diversification and excellence, and to increase the number of institutions with such characteristics. Federal policy, visible in the level of support made available, has recognized a special relationship of the Federal Government to the support of graduate education and research.

2. *What is the involvement of state and local government in this area?*

   a. *Federal, state and local government carrying their proper share of financial and administrative burden?*

   b. *What action is necessary for local and state government to assume greater responsibility?*

Table 2.

National Support for Medical Research, 1944-1969*
(Obligations in Millions)

ce of funds	1949	1954	1959	1964	1965	1966	1967	1968 est.	1969est.
T tal	$147	$237	$648	$1,652	$1,841	$2,056	$2,264	$2,473	$2,635
rnent	65	123	368	1,099	1,229	1,377	1,524	1,658	1,750
deal	65	119	351	1,049	1,174	1,316	1,459	1,589	1,677
at and local	n.a.	4	17	50	55	61	65	69	73
sty	48	61	190	400	450	510	565	635	700
at Support	34	53	90	153	162	169	175	180	185
ur ations and health agencies	20	30	49	88	92	94	98	101	102
he private contributors	n.a.	n.a.	10	22	25	28	29	30	31
dement	14	16	19	19	19	19	19	19	19
sttutions' own funds	n.a.	7	12	24	26	28	29	30	32

es only medical and health-related research; training and construction are not ued. Non-Federal data since 1964 are not strictly comparable with those for prior s as coverage has been improved.

The level of state and local support for medical research is shown in Table 2. Also the levels of support from industry an from various elements of the private sector.

The fundamental biological problems to be overcome in the prevention or amelioration of the many congenital or acquired physical or mental handicaps, an enormous amount of acute but especially chronic debilitative and degenerative disease, a tragically large incidence of premature death from specific disease and accident are identical at all levels of our societal structure--local, regional or national and therefore solutions have applicability to all people everywhere. We have emphasized high risk in the guarantee of results, high costs, and the importance of maintaining a national competence to pursue and exploit research opportunity. While the Federal Government has a stake in many kinds of activities, its role in the subsidization of the development of widely applicable technology is more unique and appropriate than it would be in direct engagement with problems subject to greater variation depending upon geographic location, e.g., rural versus urban, etc. State and local governments are burdened financially by pressing and immediate problems relating to education, crime, poverty and in the health area, the provision of health services primarily. At the state and local level, these pressing social problems must take precedence over longer-range research goals. Where state and local governments are involved in health research, it is usually in the area of more applied research in such areas as epidemiology, biometrics and the delivery of health services as appropriate to the given locale.

3. *What is the present role of non-governmental participation in this area?*

a. *Profit-making institutions?*

There is apparently a general lack of incentive in industry to engage in research and development in biomedical areas with the exception of the drug industry. For example, one of the impediments to further progress in medical engineering has been the lack of incentive of industry. In a study performed for the Director, NIH, the following conclusions were drawn:

"Because of the relatively large capital risk in a sophisticated medical engineering development effort, and because markets are slow to develop as a result of the individualized nature and general conservatism of medical practice, industry has not aggressively pursued medical engineering developments. This is especially true of many larger companies where their engineering resources can be effectively used to produce profits in defense, space, atomic energy, and various profitable commercial undertakings. There are, of course, some areas where substantial developments have taken place

(e.g., X-ray equipment), but when one considers the magnitude of the national expenditure on medical services, the progress generally has been disappointing in the light of what is technically feasible. The reason is that a medical development program of sophisticated equipment may involve from a good fraction of $1 million to tens of millions in research and development funds, and there is very little chance for immediate return on the investment. A typical course would involve the prototype equipment being tested in a research hospital for a period of several years, during which time there would be a need for maintenance and possibly significant modification by the developing firm. At this point several research hospitals might decide to try out the equipment. It may take as long as a decade to find broad acceptance and mass usage because of reluctance on the part of the clinical practitioner to "gamble" with the well-being of his patients. The equipment may even be relegated to the "attic" when judged to be of marginal usefulness or too expensive to operate and maintain. As a result, research and development capital may be tied up without producing income for approximately a decade, and even then the profit may be uncertain or insignificant.

"A potential way to reduce the risk for industry would be to use government funds to partially subsidize development costs. Unfortunately, the very stringent patent policies which apply to this area of endeavor require that inventions even partly sponsored by the government belong entirely to the government, and it is government policy to freely license any company which wishes to produce the equipment. Because this patent policy offers no protection or incentive for privately invested capital, cost-sharing arrangements are not feasible in most instances. Even if the government were to subsidize the entire cost of development there is still the question as to whether without any patent protection and with an uncertain market, the industrial firms would find the medical engineering development activities the most profitable use of their more creative physical scientists and engineers.

"Another possible means of motivating industry to risk capital in medical engineering developments is to hold forth the prospect of a rapidly developing market for their products brought about by direct government purchases or by the government providing financial aid to hospitals for the purchase of equipment. Thus, for items that might be widely purchased as part of these hospital improvement efforts, private industry might be willing to risk more capital in R & D. It should be noted, however, that where private development capital is being used, in contrast to a direct government subsidy of the development, the consumer will have to pay, in the price of the product, not only the amortization of development costs but also the amortization of unsuccessful development efforts (unsuccessful either because of technical difficulties or because of a superior product by a competitor), and a profit sufficient to interest private

capital in these relatively risky enterprises. Consequently where the government is the sole or dominant purchaser (through direct purchases or government financed purchases), it will unquestionably be cheaper, through the elimination of unnecessary duplicative developments, for the government to directly subsidize R & D. Where, however, in addition to government purchases there may be a significant market developing among nongovernment purchasers who can share the amortization of development costs and profits, then government subsidy of R & D may be unnecessary and inadvisable; this may especially be the case where the product is one which has nonmedical uses, such as computer hardware or communications equipment. On the other hand, most medical engineering products--artificial hearts, kidneys, sensors, diagnostic devices--have no nonmedical uses, and for reasons stated above are slow to be adopted by the medical profession. It is in these areas that federal sponsorship of R & D, if not a necessity, is at least likely to be the most cost effective means of getting such developments under way." 1/

b. Non-profit institutions and associations, including community groups of all kinds.

The Nation's philanthropic foundations were estimated to provide about $50 million in 1968 for the support of research in the biomedical sciences. This estimate was an extrapolation from the bench mark data for 1964 of $41.6 million established in a survey conducted by the National Science Foundation. In addition to the support of medical and health related research projects, foundations provided $4.7 million in 1964 for the construction and equipping of medical research facilities, and $7.1 million for endowments, a total of $53.4 million for scientific activities in support of medical research. 2/

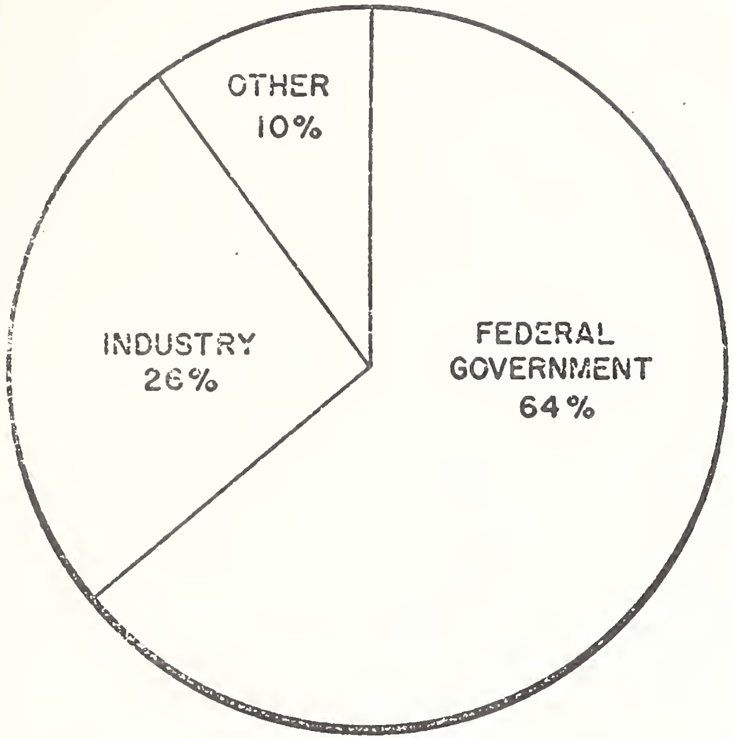
The significance of the philanthropic foundation contribution to the Nation's medical and health related research effort transcends the level of funds made available for the performance of biomedical research, for the advancement of medical education and for the construction and equipping of medical research and education facilities; by virtue of their organizational character permitting relative freedom of control and flexibility of operation, foundations are in a position to pioneer in new research areas and to utilize new mechanisms of support. Thus, they have served to help open up

1/ "Medical Engineering Development and the Role of the Federal Government." A Study Performed for the Director of the National Institutes of Health. Aerospace Corporation, July 5, 1967. pp. 8-10.

2/ Resources for Medical Research. Report No. 15. "The Medical Research and Education Activities of Foundations and Nonprofit Research Institutes. U.S. Department of Health, Education, and Welfare, National Institutes of Health. September 1968. pp. 2-3.

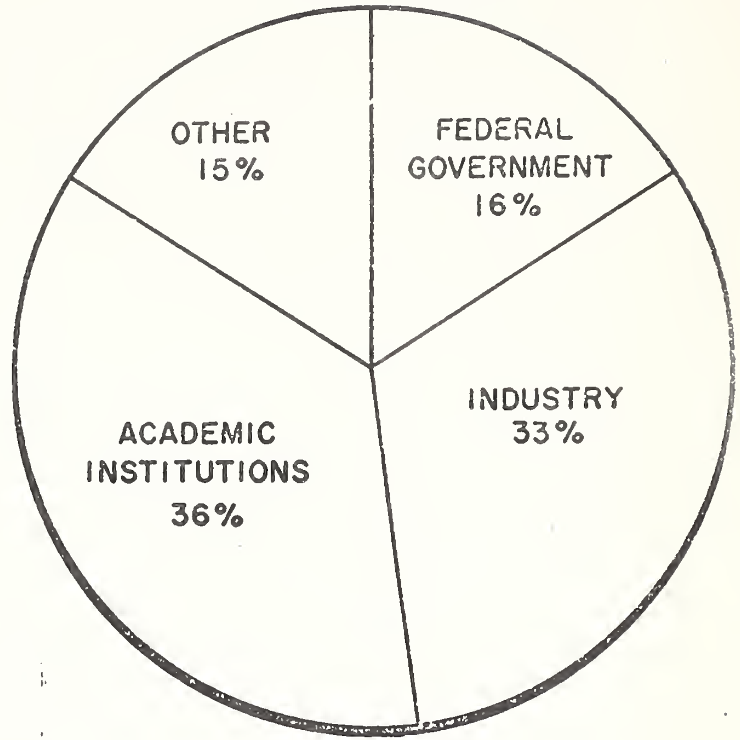
FUNDS OBLIGATED FOR MEDICAL AND HEALTH-RELATED RESEARCH
UNITED STATES - 1969 EST.

BY SOURCE



$2.6 BILLION

BY PERFORMER



$2.6 BILLION

promising avenues of research for later full exploitation through the application of greater resources made available by the American public through the action of Congress. The limited funds of foundations are used generally as venture capital to be spent on activities requiring risk and foresight which are not likely to be supported by government or private individuals. Many of the private foundations supporting biomedical research specifically identify a disease area in which they are particularly interested. They support not only research, but private study, the provision of special services, and particularly the development of materials for health education purposes. The strategy of the Ford Foundation, for example, is described as its choice of major targets being largely defined by the intrinsic importance of the targets themselves, whereas the tactics of the Foundation are defined in part by what others do and do not do. As stated in its Annual Report for 1968, the Ford Foundation says the following: "When we work directly upon problems of public education, we do so through school systems which are part of government. And when we decide on grants, we do so in the context of state and federal budgets, hundreds and even thousands of times larger than ours. . . . We encounter government both as a partner and as an economic giant. . . .We work as we do not only because we can thus achieve a national impact, but also because others have left great tasks undone. There is often a high degree of volatility in the posture and response of governments, both in policy and in appropriations." 3/

c. *Individual volunteers.*

Individual volunteers are not ordinarily the performers of research, but nonprofit research institutes perform biomedical research and did so at a level estimated at $115 million in 1968, approaching in dollar volume the research conducted by the Nation's voluntary hospitals. This estimate was based upon the 1964 bench mark data of $84.6 million established for this group of institutions in the National Science Foundation's survey. 2/

The Federal Government in 1964 was the primary source of funds--$51.7 million flowing to 174 research institutes--or three-fifths of the $84.6 million total. Research institutes' own resources financed 20 percent or $16.8 million. The remaining funds came from industry, state and local governments and other groups and individuals. 2/

3/ Ford Foundation Annual Report, 1968.

Foundations reporting in the 1964 survey spent a total of $600 million--$103 million for all research, $102 million for all science education, and $400 million for non-science programs in areas such as health services, welfare, humanities, and international activities. About one-fifth of the total program expenditures was allocated to the health area, covering research of $53 million, education $41 million, and health services $27 million. 2/

d. *How can the role of each of the above in this area be increased?*

It is probable that we are experiencing the maximal levels of support for medical research from the private and voluntary agencies. It can be seen in Table 2 that their levels of expenditure have steadily grown but it has been a relative growth. Certainly liaison with this group of agencies as has been carried out in the past (e.g., NHI and American Heart Association) will be continued. Some approaches have been suggested above toward increasing the role of industry in, for example, biomedical engineering.

4. *What is the role of the client or local community population in the program and how can it be strengthened?*

If the client in this context is viewed as the recipient (whether individual investigator or the institution) of research support, the role is clearly a partnership with the Federal Government in the pursuit of knowledge to solve national health problems. Over the past fifteen years, the NIH has pursued a positive policy of concentrating its primary growth in the research activities of academic institutions, rather than enlarging to the extent that would be necessary either federally conducted programs or those of industrial organizations without parallel educational responsibilities.

The choice of the academic institutions as the core of the developments over the past two decades was appropriate to the state of development of the biomedical sciences. The advantages of this locus to the Federal Government are found in the coupling of education and research, the establishment of a strong, coherent

scientific base, the opportunities offered by the availability of skilled, creative inve... ..gators in the form of faculty and graduate students, the responsiveness of the developing system to the consensus of the scientific community as to opportunities available, and the relatively quick ability to translate new research findings to the educational apparatus of these institutions. Such a priority had the added advantage in the conversion of new knowledge to practice within the unique and rapidly evolving university medical centers. The side benefits include the contributions which these research projects and research funds have made to faculty and student development and to the improvement of the institutional environment.

Establishing these programs at academic institutions places substantial responsibility on the scientific community for the direction and character of research, and it permits less substantive control to be exercised by the Federal administrators. It also implies that the most appropriate mechanism of support is the grant-in-aid; the most effective support is a relatively stable, long commitment.

These terms and conditions continue to be optimal for a major portion of the program as long as the academic institutions are the most appropriate loci, and the overwhelming need is to establish a broad science base. However, the transformations which have taken place within biomedical science and within the academic institutions as the result of NIH programs, have raised questions about whether the earlier patterns of support should continue to be dominant to the same extent as the further development of the program is considered. The progressive establishment of the scientific base and the maturation of many areas of the biomedical sciences are increasingly providing greater opportunity and usefulness for the Federal initiation of research programs with varying degrees of formal organization. Such organized programs do now, in effect, represent new and burgeoning areas whose rapid growth should be encouraged. But the development of such extensive programs may not be possible within the project system and the project system should not be modified to encompass them. Rather they require quite different mechanisms which provide the benefit of a more structured activity in a setting which could be characterized as a specialized center or in the extreme, the research institute not necessarily located within academic institutions.

The increasing size and scope of biomedical research and the rapid accretion of substantial knowledge are providing a situtation wherein the definitive exploitation of information already at hand requires specialized research resources, not readily available

within the academic institutions. The potential contribution presented by industry and university based contract laboratories is already evident and will become more so with the further maturation of identifiable scientific areas.

Nonetheless, it is to be strongly emphasized that the growing efforts which will continue to characterize the growing edge of science and the penetrating exploration of not well understood complex biological systems can best be exploited through the support of individual scientists or groups of scientists through project grants with little substantive constraints. These are generally found in the academic environment or in closely associated institutions and it is through the vitality of this mechanism that our "clients" are strengthened.

An additional means of strengthening the research community is to afford some degree of stability through institutional support as in general research support grants which is in the form of a research override on a formula basis. An additional mechanism which can aid in improving the quality of the research community is the development grant most often used to raise a given segment of an institution to a level of excellence. All of these mechanisms used in a proper mix work to strengthen the network of clients and enhance the system more effectively than could any single instrument of support.

5. *In attempting to meet current social needs, what new social and economic problems may be created by this program?*

In attempting to meet the need to prevent, control, and eradicate disease, the price of success in some instances has resulted in an increasing number of aged individuals and an increasing number of individuals who survive with chornic diseases. In the latter instance, such individuals may be maintained in a productive stage and can continue to support their families, but at the same time, there are instances when the maintenance for some such patients is very costly. There are the hard questions of maintenance when the cost far exceeds the capacity of individual families, or even catastrophic insurance programs.

In addition, with a more educated public and because of the extensive communications media available, there is a growing awareness of the possibilities for the therapy of disease and demands for medical services are constantly increasing. While it is ironic that such developments lead to new social and economic problems, it is inhumane to deny such interim benefits as the extention of life

and the alleviation of suffering in every way possible during life, while we reach for ultimate and final answers to the causes and thus the prevention of such dread diseases as cancer. It would also be shortsighted not to continue to advance the frontiers of knowledge with the ultimate hope of finding the necessary answers, simply to avoid economic problems which may be precipitated along the way.

In a completely different frame of reference, in concentrating the primary growth of the research programs in academic institutions, particularly medical schools, as previously explained, the interdependence of these institutions and the Federal Government has become more profound over the years. For example, in 1966-67 the percentage of total medical school expenditures paid by Federal funds was 52 percent; the percentage of sponsored research paid from Federal funds was 82 percent; and the percentage of total medical school expenditures paid for Federal research was 34 percent. In solving one problem--the need for Research and the location of the best cadre of performers, another set of problems came into being. Fortunately the newer set of problems is more amenable to solution by dollars, whereas success in research per se is less predictable and measurable.

6. *When, if ever, can Federal Government participation in this area be phased out?*

Some of the characteristics of the system which has been evolved to sustain and carry out this national research effort have been described in previous sections. The alternative to Federal support is support from the philanthropic agencies. Substitutive funds of this type would not be relatively available in any reasonable order of magnitude to sustain and maintain the level of our present national competence in research. Therefore, it is unlikely that Federal participation can be diminished to any significant extent. The important decision for the present and the future is to determine a reasonable growth rate for research expenditures.

Federal participation in the support of biomedical research can be stopped, but the consequences would be the collapse of the system for the advancement of knowledge and of health professions schools; and medical and dental schools particularly would be reduced to "trade" schools. Following World War II when the power of science to solve serious national problems was realized, the public demanded and expected support for research. This began most effectively through the expansion and growth of a number of

private, voluntary health agencies, but particularly in the late '40's and the decade of the '50's, the Congress responded as a matter of public policy with extensive support for biomedical research.

Federal outlays for health are estimated to rise to $18.3 billion in 1970 equal to 9 percent of all Federal outlays. In 1968, national expenditures for health rose to $53 billion of which Federal funds financed 24 percent, state and local were 13 percent and private sources were 63 percent. In 1968, Federal outlays for health research were approximately 3 percent of total national health outlays. Total outlays for health will continue to rise and the Federal share will also probably rise; the percentage of the outlay for research in relative terms is modest in view of the fact that in the "health industry" it is new knowledge on prevention, therapy, and rehabilitation that has the greatest impact on needs for health services which are the most costly portion of the whole enterprise. The question at issue is not whether Federal participation in the support of medical research can be phased out, but at what level it should be sustained.

7. a. To what extent is the program attempting to provide models and experiments for new ways to attain national goals?

Since the program is research, it is totally involved in the development of new ways to attain the national goal of improvement of health and the prevention of disease.

b. To what extent do obsolete rigidities hinder progress in the program area?

In general there are no great rigidities either on the side of instruments of support or societal constraints which hinder progress. With regard to the grant-in-aid the statutory requirements for cost-sharing involves considerable administrative effort and costs, for both the awarding agencies and grant recipients.

Federal patent policies have been mentioned as a problem in engaging industry in biomedical engineering; this is also true in other areas.

Other things could be mentioned as the laws relating to the licensing of devices and the need for standard statutes on the donation of human tissues and organs.

c. What can be done about it?

Most of these matters would require some legislative modifications.

C. Evidence of Program Effectiveness

1. *What is the evidence that the objectives discussed above are really served by the programs?*

In the absence of quantitative measures of direct cause and effect, two varieties of evidence can be cited that the goal of increasing knowledge and the objectives previously described are served by the program. Some of the results of the research have been cited under the on "What are the outputs." These are specific achievements which have flourished as a result of the level of research activity. The latter can in part be measured by how many investigators have been supported in what disciplines, in what types of institutions, etc. Tables 3 through 7 summarize a few of these statistics. (See pages 27-34.)

a. *Summarize findings of studies.*
b. *Indicate evaluations-in-progress.*
c. *List recent non-agency evaluations of programs.*

The NIH, its programs, and the policies and practices involved in their administration have been submitted to searching evaluative studies under Executive, Legislative, and non-Federal auspices. From 1956 through 1967, the NIH was the subject of 11 major inquiries:

- Medical Research Activities of the Department of Health, Education, and Welfare (C.N.H. Long Report), 1956(3).
- The Advancement of Medical Research and Education Through the Department of Health, Education, and Welfare (Bayne-Jones Report), 1958(4).
- Federal Support of Medical Research (Boisfeuillet Jones Report), 1960(5).
- Health Research and Training: The Administration of Grants and Awards by the National Institutes of Health (1961 Fountain Report), 1961(6).
- Administration of Grants by the National Institutes of Health: Reexamination of Management Deficiencies (1962 Fountain Report), 1962(7).
- Organization of Public Health Service (Harris-Roberts Study), 1963(8).

(Narrative continued on page 35.)

TABLE 8

AWARD RATES FOR COUNCIL–APPROVED NEW NIH RESEARCH GRANT APPLICATIONS REVIEWED

Council Years 1964, 1966 and 1968*

Institute or Division	Number reviewed			Approval rates						Award ratios†					
				Number			Amount‡			Number			Amount		
	1964	1966	1968	1964	1966	1968	1964	1966	1968	1964	1966	1968	1964	1966	1968
I/D Total	4,931	5,348	5,229	54.0	54.7	53.1	47.3	48.6	43.1	89.4	69.6	.63.0	92.5	76.8	69.3
NIAID	571	611	593	49.0	58.1	59.2	46.8	52.9	53.3	77.1	58.9	67.7	79.5	65.1	69.4
NIAMD	1,030	931	978	55.2	54.1	57.0	47.9	50.6	47.0	92.6	66.3	60.4	93.0	68.3	62.8
NCI	515	483	519	42.7	44.3	49.7	38.8	53.1	45.6	85.0	68.7	75.2	83.6	84.1	76.2
NICHD	298	646	652	57.0	46.6	41.6	46.4	36.5	27.6	95.9	91.0	58.8	97.8	90.0	66.6
NIDR	182	185	177	59.9	51.9	40.7	55.5	43.4	36.2	75.2	65.6	60.0	78.8	65.8	53.4
DEHS/NIEHS§	§	§	97	–	–	48.5	–	–	30.6	–	–	71.7	–	–	74.7
NIGMS	840	945	826	59.0	62.4	60.0	51.8	53.7	46.2	87.5	46.6	35.7	88.7	59.6	59.7
NHI	782	815	740	48.7	52.6	48.4	42.8	43.9	37.6	96.6	90.2	63.8	110.1	87.6	72.7
NINDB	620	607	585	58.5	55.4	57.1	46.8	46.1	44.6	90.6	76.2	88.2	94.6	83.2	87.9
DRFR	47	59	59	63.8	64.4	57.6	56.9	59.1	64.4	100.0	84.2	81.3	90.0	95.9	72.1
OIR/FIC	46	66	3	100.0	92.4	–	100.0	107.3	–	97.8	93.4	–	101.7	85.0	–

*A council year consists of June, November and March meetings — e.g., council year 1968 consists of the June 1967, November 1967 and March 1968 meetings.

†For CY 1964 and 1966, the ratio is based on the number (or amount) awarded by Institute or Division to the number (or amount) approved by council. For CY 1968 the ratio is estimated from awards on CY 1968 council-approved applications with requested start dates through February 1969.

‡Rate of amount approved to amount requested by grantee. §DEHS was established in 1966.

TABLE 3

NIH GRANTS AND OTHER AWARDS BY YEAR AND TYPE OF AWARD, FY 1955-1968

(Dollars in millions) *

Fiscal year	Total amount*	Research grants †		Research contracts	
		Number§	Amount	Number	Amount
1955	$ 55.2	3,280	$ 35.5	–	$ –
1956	64.7	3,475	40.4	–	–
1957	156.1	6,300	82.9	43	1.9
1958	191.3	7,134	101.3	176	11.0
1959	260.2	9,056	141.4	321	17.2
1960	354.7	11,571	198.8	286	23.1
1961	481.0	13,534	272.9	311	22.9
1962	600.3	14,975	372.1	419	28.1
1963	710.1	15,973	430.9	496	38.3
1964	815.9	16,020	497.9	597	42.7
1965	892.8	15,792	538.8	474	48.6
1966	1,042.2	15,686	601.0	590	53.3
1967‖	926.9	14,313	593.3	835	83.9
1968	972.5	13,270	620.2	956§	90.7
1968	1,199.1	13,446	626.0	1,088§	97.1

‖ Excludes NIMH; includes DEHS.(All prior years include NIMH.)

* See "Basic Data Relating to the National Institutes of Health, 1968."

TABLE 4

NIH RESEARCH GRANTS TO DOMESTIC INSTITUTIONS OF HIGHER EDUCATION BY MAJOR COMPONENT, FY 1967 – 1968*

(Dollars in thousands)

Major component	1967†		1968	
	No. of grants	Amount	No. of grants	Amount
Total higher education	10,984	$462,688	10,374	489,401
Health-related components	7,808	345,221	7,333	364,947
Medical	6,723	299,218	6,266	316,460
Dental	264	12,486	268	12,220
Public health	160	10,626	154	11,336
Joint‡	255	7,054	247	7,773
Veterinary	186	7,053	183	7,581
Hospitals	50	4,380	49	4,716
Pharmacy	138	3,545	139	4,057
Other health-related	32	859	27	804
Other components	3,176	117,467	3,041	124,454
Arts & sciences	2,136	66,760	2,065	71,319
Agriculture	413	11,293	352	11,412
Engineering	188	8,288	179	8,711
University-wide	107	9,952	107	8,903
Graduate schools	167	8,965	152	8,216
Organized research units	91	6,123	91	6,352
Primate centers	14	2,930	16	4,707
Computer centers	10	870	14	2,646
Other	50	2,286	65	2,188

* Includes general research support and research resources grants.

† Excludes NIMH; includes DEHS.

‡ Includes departments of basic medical science serving two or more major components, and Rochester U. School of Medicine and Dentistry.

91

NIH RESEARCH GRANTS BY DISCIPLINE/FIELD, FY 1967 – 1968
(Dollars in thousands)

Discipline or field*	1967†				1968			
	No. of grants	Percent	Amount	Percent	No. of grants	Percent	Amount	Percent
Total	13,937	100.0	$593,313	100.0	12,947	100.0	620,195	100.0
Research projects	12,909	92.6	387,176	65.3	11,850	91.5	389,819	62.9
Biochemistry and biophysics	3,080	22.1	89,589	15.1	2,819	21.8	90,172	14.5
Physiological sciences	2,877	20.6	79,864	13.5	2,577	19.9	78,821	12.7
Pharmacological and pharmaceut.sc.	896	6.4	29,411	5.0	893	6.9	30,474	4.9
Microbiology and parasitology	817	5.9	26,029	4.[illegible]	778	6.0	29,131	4.7
Pathology	759	5.4	27,912	4.7	66[illegible]	5.1	26,224	4.2
Immunology	708	5.1	22,020	3.7	67[illegible]	5.2	22,445	3.6
Cell biology	622	4.5	17,505	3.0	552	4.3	17,608	2.8
Genetics	499	3.6	16,471	2.8	450	3.5	16,093	2.6
Chemistry	507	3.6	13,274	2.2	476	3.7	13,742	2.2
Growth and development	468	3.4	12,163	2.0	395	3.1	10,074	1.6
Psychology	303	2.2	11,218	1.9	278	2.1	9,311	1.5
Nutrition	264	1.9	8,098	1.4	241	1.9	8,786	1.4
Information and computer sciences	165	1.2	5,437	0.9	175	1.4	6,980	1.1
Engineering and bioengineering	172	1.2	6,146	1.0	154	1.2	6,742	1.1
Anatomy	238	1.7	6,242	1.1	242	1.9	6,211	1.0
Other	534	3.8	15,797	2.7	482	3.7	17,005	2.7
Program projects and centers	634	4.5	154,436	26.0	675	5.2	170,702	27.5
General grants-in-aid	394	2.8	51,701	8.7	422	3.3	59,674	9.6

* Rank based on FY 1968 dollars except for program project and center grants and general grants-in-aid.
† Excludes NIMH; includes DEHS.

NIH RESEARCH GRANTS BY KIND OF RECIPIENT INSTITUTION, FY 1967 – 1968*
(Dollars in millions)

Kind of recipient institution	1967†			1968		
	Number of institutions‡	Grants		Number of institutions‡	Grants	
		Number	Amount		Number	Amount
Total	1,129	13,937	$593.3	1,017	12,947	620.2
Higher education	379	10,984	462.7	362	10,374	489.4
Research institutes	131	713	47.1	118	683	51.4
Hospitals	208	1,397	64.5	198	1,214	62.8
Graduate training centers	1	1	§	1	4	0.1
Patient centers	15	45	2.8	12	29	2.1
Associations, etc.	45	81	2.3	40	71	2.3
Government units	19	42	2.7	25	50	3.2
Other domestic	33	52	2.7	19	29	1.8
Foreign	298	622	8.5	242	493	7.1

* Includes general research support and research resources grants.
† Excludes NIMH; includes DEHS.
‡ The count of institutions considers each branch separately.
§ Less than $50,000.

NOBEL PRIZE WINNERS
SUPPORTED BY
NATIONAL INSTITUTES OF HEALTH

Laureates	Nobel Prize Year	Nobel Prize Category
Warburg, Otto (Germany)	1931	Medicine
Murphy, William P., Jr. (U.S.)	1934	Medicine
Szent-Gyorgi, Albert (Hungry)	1937	Medicine
Heymans, Corneille (Belgium)	1938	Medicine
Ruzecker, Leopold (Switzerland)	1939	Chemistry
Lawrence, O. E. (U.S.)	1939	Physics
Doisy, Edward A., Jr. (U.S.)	1943	Medicine
Erlanger, Joseph (U.S.)	1944	Medicine
Sumner, James B. (U.S.)	1946	Chemistry
Stanley, Wendell M. (U.S.)	1946	Chemistry
Muller, Herman (U.S.)	1946	Medicine
Cori, Carl (and Gerty) (U.S.)	1947	Medicine
Housay, Bernardo (Argentina)	1947	Medicine
Hench, Philip (U.S.)	1950	Medicine
Waksman, Selma (U.S.)	1952	Medicine

Laureates	Nobel Prize Year	Nobel Prize Category
Krebs, Hans [illegible] (United Kingdom)	1953	Medicine
Lipmann, Fritz (U.S.)	1953	Medicine
		(Training Grant)
Linus Pauling (U.S.)	1954	Chemistry
Robbins, Frederick (U.S.)	1954	Medicine
Enders, John (U.S.)	1954	Medicine
Weller, Thomas H. (U.S.)	1954	Medicine
du Vigneaud, Vincent (U.S.)	1955	Chemistry
Richards, Dickinson (U.S.)	1956	Medicine
Cournand, Andre (U.S.)	1956	Medicine

Laureates	Nobel Prize Year	Nobel Prize Category
Beadle, George (U.S.)	1958	Medicine
Lederberg, Joshua (U.S.)	1958	Medicine
Tatum, Edward L. (U.S.)	1958	Medicine
Ochoa, Severo (U.S.)	1959	Medicine
Kornberg, Arthur (U.S.)	1959	Medicine
Medawar, Peter (United Kingdom)	1960	Medicine
Kendrew, John (United Kingdom) (Co-Investigator under Lawrence Bragg)	1962	Chemistry

Laureates	Nobel Prize Year	Nobel Prize Category
Watson, James (U.S.)	1962	Medicine
Block, Konrad (U.S.)	1964	Medicine
Woodward, Robert B. (U.S.)	1965	Chemistry
Monod, Jacques (France)	1965	Medicine
Huggins, Charles B. (U.S.)	1966	Medicine
		(Career Research Professor)
Wald, George	1967	Medicine
Hartline, Haldan K.	1967	Medicine
Nirenberg, Marshall	1968	Medicine
Holley, Robert	1968	Medicine
Khorana, Har Gabind	1968	Medicine

- Federal Support of Basic Research in Institutions of Higher Learning (Kistiakowsky Report), 1964(9).

- Biomedical Science and Its Administration (Wooldridge Report), 1965(10).

- Investigation of HEW (Rogers Special Subcommittee Report), 1966(11).

- Report of the Secretary's Advisory Committee on the Management of NIH Research Contracts and Grants (Ruina Report), 1966(12).

- Report of the Commission on Research, American Medical Association (AMA Report), 1967(13).

- Administration of Research Grants in the Public Health Service (1967 Fountain Report), 1967(1).

In addition, the programs of NIH have shared with other Federal research programs the broader reviews carried out by the Elliott Committee, the Daddario Committee, the Harris Committee, the Reuss Committee, etc. Beyond these more or less ad hoc studies, the programs of NIH have annually undergone rigorous review by the cognizant appropriation subcommittees in the House and Senate. The number of pages of the hearings and reports of these committees devoted to NIH is evidence of the scope and depth of the congressional examination carried out in the annual appropriation process.

Two of the recent external studies of the National Institutes of Health were conducted under most distinguished and publicly responsible superintendence. These groups examined in a deliberate and specific manner the quality of the science supported and the consequences of the programs underway. Because of the competence and distinction of these two groups, their summary findings are clearly germane to the question of how well the public interest is being served through the programs of NIH.

1. The Wooldridge Committee Report

The first of these studies was carried out as an official exercise at the direct request of the President of the United States. It was conducted by a committee of distinguished industrialists, university administrators, and scientists over the period of a full year under the chairmanship of Dr. Dean E. Wooldridge. The committee utilized some 12 expert panels comprising about 100 scientists who examined every facet of NIH and its activities. The overall judgment of NIH expressed by this committee in its report to the President was as follows:

"In brief, we consider the NIH program to be sound and recommend its continued support. Its one billion dollar budget is not high, when compared to the more than thirty billion dollars a year the American public pays for assorted health services; the money is on the whole being competently and efficiently employed on a broad spectrum of health-related research; lessons from the past history of science, supported by the current acceleration of medical discovery, strongly suggest a satisfactory future pay-off. Furthermore, as discoveries are made in the life sciences and the physical sciences, new opportunities will be created for health research and these too should be exploited with the enthusiasm and vigor which has distinguished the NIH program during the past decade. We feel that the Congress in particular deserves considerable credit for its past and continuing support of this kind of farsighted program. We suspect that there are few, if any, one billion dollar segments of the Federal budget that are buying more valuable services for the American people than that administered by the National Institutes of Health."*

"The Committee believes that the current billion dollar budget of NIH is not too high and that it constitutes a sound investment for the American people."**

2. The AMA Report. The second examination was carried out under the auspices of the American Medical Association, at the direction of the Board of Trustees of the AMA, as a basis of declaring the future policy of the Association on the Federal support of medical research. A commission was created in 1964 for this purpose, chaired by the Honorable Charles E. Whitaker, retired Supreme Court Justice. This commission was directed to assess the impact of Federal support of medical research upon the conduct of research itself and upon medical schools, the education of physicians, and the provision of medical services. After a two and one-half year study, the commission's report was published in early 1967. The basic conclusion reached by the commission was as follows:

"We have sought the counsel of representatives of the medical community who have firsthand knowledge of conditions. We have studied the literature of critical commentary. We have drawn upon our own individual experiences and observations. All of this we have done in an effort to discern the truth of conditions in response to the charges given to us. Having sifted through many of the complaints and counter-complaints, we conclude that there is at least some merit to all of them, yet we also conclude that on balance the public has benefited immensely from the total effort in medical research which largely has been carried out since World War II under the aegis of the National Institutes of Health.

"In saying this, we do not deny that the growth of the national commitment to medical research has been attended by serious problems. To the contrary, many problems can be identified. This is normal--an expected fallout of progress. The challenge is not whether problems ought to be avoided--for this would be hoping for too much--but whether medical leaders and Federal administrators are able to cope realistically and constructively with them in the broadest public interest."

The findings of the study were, on the whole, favorable to NIH and, on such critical matters as the quality of its research programs and their impact upon medical education and services, entirely supportive. As reflected by the above excerpts, the commission noted stresses and strains as well as imbalances in the development of the Federal support. These, the commission considered to be an inescapable part of the evolution of a massive and complex set of activities.

Study and examination of the kind carried out by the above groups can help to provide a basis of judging the overall effectiveness of NIH programs. In general, the judgments reached by all the groups concerned with the consequences of NIH programs, as well as their administration, have not only been favorable but strongly supportive of NIH, while at the same time providing constructive advice for continuing improvement.

Brief summaries of the studies listed above appear in Appendix C, Part I. In addition, the NIH itself prepared a report to the President on its research programs entitled, "<u>The Advancement of Knowledge for the Nation's Health</u>" which was published in July 1967. There have been and are ongoing a series of studies and evaluations directed at specific scientific or research areas. Each Institute has provided a brief statement of the kinds of activities being undertaken in the area of evaluation and a number of additional reports are cited. These appear in Appendix C, Part II.

2. *Does the program provide for adequate monitoring and evaluation of performance and do these affect program administration?*

Yes. The program provides for a unique and very satisfactory system of monitoring. Whether the project is supported in the name of a principal investigator or on an institutional basis, it is reviewed first for scientific merit and then for conformance with policy and for program relevance. For the great bulk of the program, this review is conducted by means of a comprehensive array of Study Sections and Advisory Councils, many of the latter established by Statute. The Study Sections are committees of experts in the discipline, specialty, or field who are primarily from the private sector and are not federally employed, although occasionally outstanding intramural scientists are appointed to these bodies. The Study Sections meet together formally on a regular basis and are served by a full-time NIH Executive Secretary, who is insofar as possible an accredited scientist himself in the particular discipline. Recommendations of scientific merit are reviewed by staff and presented to the statutory Advisory Councils made up of non-Federal scientists,

professionals, and lay members who consider matters of policy and program relevance in assigning final priorities. There are 46 Study Sections, a small number of Program Project Committees, and 11 Advisory Councils which currently make use of approximately 820 non-government scientists.

This system is characterized as "peer judgment" evaluation and undoubtedly has served the program well over the past two decades in maintaining a national standard of quality overall in the selection of projects. While projects are reviewed annually by scientific staff and management specialists, the formal review process takes the projects again through Study Section and Council if they are to be considered for renewal. On the average, renewal occurs in three years (sometimes five) so that the full-dress review occurs every two to four years. An unmeasurable, but probably not insignificant effect, is the continued stimulus to excellence on the part of the grantee because of the necessity for standing for repeated national competition.

A recommendation of the Wooldridge Committee in its February, 1965 report was: "The Study Section procedure utilizing scientific peer judgments is the best available method for awarding research grants. It should be preserved and strengthened by administrative devices which will lessen the load on individual Study Section members without decreasing their opportunity to make scientific judgments." 4/

In addition to monitoring and evaluating individual projects, from time to time Study Sections, Councils or staff commission or themselves undertake evaluations of the state of the art or progress in a given field of science. This is considered part of the charge to Study Sections as well as an important responsibility of the Administration. Examples of such evaluations were cited in Appendix C, Part II.

Table 8 shows the number of projects approved by Study Sections and Councils and the number of awards made from funds available in 1968.

3. *Should the program be consolidated with similar programs elsewhere within or outside of DHEW? If not, why not?*

Just a year ago, the biomedical research program was administratively consolidated with those programs which support education and the development of manpower in the health professions and those in support of biomedical communications. This amalgamation provides the

4/ "Biomedical Science and its Administration." A Study of The National Institutes of Health. Report to the President. February, 1965. p. 33.

opportunity to bring into balance the programs in these three areas and to administer them more consistently to the advantage of both the Federal Government and the recipient community. Research and education are so interrelated in the institutions which comprise our constituency, it is as false to separate them at the Federal level as at the institution. Health science libraries and communications networks are so much a part of the "woop and warf" of the research and educational process, it is advantageous to maintain this relatively small but vigorous effort in the mainstream of the activity relative to the generation of new knowledge and its transfer through education. Effective library resources and communications activities are essential to the organization, preservation and transmission of knowledge.

It has been suggested that if an agency or department of government were established to oversee all of academic science that the strongly science based activities of NIH should be transferred out of DHEW to such an agency. If not at the general level,certainly this question is raised at the specific level in the context of the consideration of such legislation as H.R. 35 (the Miller Bill) which proposes extensive institutional support in the area of science. It should, therefore, be emphasized that to retain the unusual capability presently available through the legislative authorities of the DHEW, particularly those relative to the NIH (and given sufficient implementing funds) is essential to the maintenance of our national capability for expanding and advancing knowledge in the service of the mission of improving the health and quality of life of our people.

D. Distribution and Recipient Data

1. *If State grant program--present tabular listing of distribution by State (dollars and percent). Relate to best measure of State need and evaluate distribution formula.*

Not applicable.

2. *Who gets how much (percent).*

a. *By target group of recipient?*

Target group not precisely applicable. Primary focus is on national biomedical research community.

b. *By control and type of institution.*

In 1968 NIH obligated $724 million for extramural research. Institutions of higher education received $520 million--more than 70 percent of the total. Medical schools (not counting affiliated teaching hospitals) received $299 million, nearly 60 percent of research funds obligated to institutions of higher education. The distribution by control and type of institution is shown below.

istribution of NIH Extramural Support by Type of Institution and by Type of Control, FY 1968

ype of recipient	NIH Support (in millions) Total Amount	Total Percent	Total Percent	Public Amount	Public Percent	Private Amount	Private Percent
Total	$723.9	100	100	$293.6	41	$430.1	59
itions of higher education	519.5	72	100	259.8	50	259.7	50
dcal schools)	(299.0)	(41)	100	(150.0)	(50)	(149.0)	(50)
r nonprofit	131.3	18	100	-	-	131.3	100
s ry	39.1	5	100	-	-	39.1	100
e and local	20.6	3	100	20.6	100	-	-
r	13.2	2	100	13.2	100	-	-

c. Indicate source and validity of data.

Data are collected by annual survey of Federal support of medical and health-related research and training and submitted to the Office of Resources Analysis, NIH. Data are valid but expressed in obligations rather than as expenditures.

3. *In what geographical area does the program have its principal impact?*

a. Urban or rural?

The principal impact is upon urban areas where major institutions of higher education, medical schools, research institutes, and teaching hospitals are located. More than 80 percent of the NIH extramural research dollar flows through SMSA's; balance is primarily to large universities located outside SMSA's, e.g., Cornell at Ithaca, Penn State, Purdue, etc.

b. Region of United States?

Three Census regions (Pacific, Middle Atlantic, and East North Central) receive more than 50 percent of the NIH extramural dollar. California received more than $90 million, New York slightly over $100 million. (See Tables 9 and 10.)

c. Should the target area be broadened or otherwise changed?

The target areas should be broadened as 25 new medical schools and 150 new graduate schools offering programs in the biomedical sciences are established, primarily in urban areas and, frequently, in rapidly growing urban areas, e.g., San Jose, San Diego, Phoenix.

4. *a. Is the program defined to serve a particular target population? If so, what population?*

The program is broadly defined to serve the American people of all age groups, races, and economic classes by improving the quality and accessibility of health services through the development and application of new knowledge through research.

b. Does the program in fact serve that group?

Yes.

TABLE 9

D stribution of NIH Support for Conduct of Research by Extramural P rformers, Total, and Academic Institutions, by Census Region, F 1968

egion and state	NIH Support			
	Amount		Percent	
	Total	Academic Institutions	Total	Academic Institutions
	(in millions)			
Total	$723.9	519.5	100	100
dc e Atlantic	164.5	111.3	23	21
c ic	118.6	90.8	16	18
s North Central	104.5	82.1	14	16
u Atlantic	93.4	68.5	13	13
w ngland	88.8	50.3	12	10
s North Central	51.9	41.9	8	8
s South Central	45.0	37.7	6	7
s South Central	25.2	20.8	4	4
u tain	17.1	15.6	2	5
r itories	1.8	.7	1/	1/

s than .5 of one percent

TABLE 10

Distribution of NIH Support for the Conduct of Research by Extramural Performers, Total, and Academic Institutions, by Census Region and State, FY 1968

Region and state	NIH Support: Amount: Total	NIH Support: Amount: Academic Institutions	NIH Support: Percent: Total	NIH Support: Percent: Academic Institutions
Total	$723.9	$519.5	100.0	100.0
ngland	88.8	50.3	12	10
chusetts	67.4	32.2	10	6
ecticut	13.5	12.2	2	2
e Island	2.5	2.3	2/	2/
ont	1.9	1.8	2/	2/
lampshire	1.8	1.8	2/	2/
e	1.7	1/	2/	2/
e Atlantic	164.5	111.3	23	21
York	108.5	76.7	15	15
sylvania	45.2	29.8	6	6
Jersey	10.7	4.7	2	1
North Central	104.5	82.1	14	16
nois	31.8	23.0	4	4
igan	23.1	18.4	3	4
	22.8	16.0	3	3
onsin	16.5	15.2	2	3
ana	10.2	9.4	1	2
North Central	51.9	41.9	7	8
ouri	19.7	16.6	3	3
esota	16.9	11.8	2	2
	6.4	5.8	1	1
as	5.5	4.3	1	1
aska	2.9	2.9	2/	1
h Dakota	.4	.3	2/	2/
h Dakota	.2	.2	2/	2/
Atlantic	93.4	68.5	13	13
land	31.1	18.1	4	4
h Carolina	20.1	18.8	3	4
inia	12.4	7.4	2	1
ida	11.4	9.9	2	2
rict of Columbia	8.9	5.1	1	1
gia	6.4	6.4	1	1
Virginia	1.6	1.6	2/	2/
h Carolina	1.1	1.1	2/	2/
ware	.3	.2	2/	2/

egion and state	NIH Support			
	Amount		Percent	
	Total	Academic Institutions	Total	Academic Institutions
h Central	25.2	20.8	4	4
e	11.2	9.3	2	2
	7.6	5.1	1	1
	3.8	3.8	1	1
ppi	2.6	2.5	2/	1
h Central	45.0	37.7	6	7
	30.0	25.6	4	6
ia	9.6	8.1	1	2
	3.8	2.3	1	1
	1.6	1.6	2/	2/
	17.1	15.6	2	5
	7.9	7.1	1	1
	5.7	5.6	1	1
ico	1.7	1.3	2/	2/
	1.1	1.0	2/	2/
	.4	.4	2/	2/
	1/	1/	2/	2/
	1/	1/	2/	2/
	1/	1/	2/	2/
	118.6	90.8	16	18
ia	89.9	66.7	12	13
on	15.3	13.9	2	3
	10.1	7.2	1	1
	2.9	2.6	2/	1
ies	1.8	.7	2/	2/
Rico	.3	-	2/	-
	13.0	-	2/	-

than $50 thousand
than .5 of one percent

Office of Resources Analysis, AD/PPE
April 1969

c. Is the target population too broad in light of budget restraints?

No. The target population is not too broad because (1) health and disease problems afflict all age groups, races and classes and (2) Congressional and Executive Directives mandate consideration to this wide range of health problems.

d. What groups not served by the program are unable to buy or otherwise obtain similar services elsewhere? For example, the working poor.

Not applicable.

5. *a. How does the total federal, state and local effort in this area compare to past efforts in the United States?*

The total Federal, State, and local effort in 1969 is only slightly above the 1966 level. Federal support for biomedical research grew steadily between 1947 and 1966; the rate of growth since 1966 has barely kept pace with rising costs.

b. Current efforts abroad?

It is difficult to compare U.S. efforts with those of other countries because of lack of compatibility in coverage both in the public and private sectors.

UDGET INFORMATION

l. Report FY 1968-70 Financial Data (Budget Authority and Outlays) (See pages 69-86, Tables 15 through 32.)

3. Report history of Division submission, bureau recommendation, agency budget, Department budget, and Congressional action for each year. (See page 58a)

C. For FY 1970, indicate what part of budget is (See page 49)

1. *uncontrollable (why)?*

2. *committed (how?)*

3. *discretionary*

National Institutes of Health
(in thousands of dollars)

		NIH Preliminary to DHEW	DHEW Estimates to BoB	President's Budget	President Nixon Budget	Appropriation	Apportionment	Obligation
Research Grants Total	1968	721,586	694,503	644,489		642,489	626,405	617,085
	1969	726,776	711,668	651,963		635,563	616,313	
	1970	704,767	649,668	634,166	626,414			
Regular	1968	528,794	508,778	483,606		482,026	468,369	461,327
	1969	542,488	528,212	487,418		473,114	453,933	
	1970	513,475	470,665	464,165	462,565			
Special Programs GRSG	1968	63,237	63,237	56,033		56,033	54,217	54,217
	1969	57,213	56,381	52,945		52,945	52,945	
	1970	58,040	54,778	53,637	52,945			
Other Special	1968	129,555	122,488	104,850		104,430	103,819	101,541
	1969	127,115	127,075	111,600		109,504	109,435	
	1970	133,252	124,225	116,364	110,904			

III. LEGISLATIVE CHANGES (RECENT).

A new National Eye Institute was authorized by P.L. 90-489, dated August 16, 1968. The vision research program--both extramural and intramural--previously in the National Institute of Neurological Diseases and Blindness, are expected to be transferred to the new Institute, to provide the base for further development of its vision research activities.

In a related action, P.L. 90-639 changed the name of the National Institute of Neurological Diseases and Blindness to the National Institute of Neurological Diseases and Stroke. The speed with which the new Institute is brought to full operational level will depend on when and to what extent needed additional resources in the form of space, personnel ceiling, and funds can be made available.

IV. FORWARD PLAN

A. National Goals, Needs and Program Objectives

The Extramural Research Program has two primary objectives in support of the national goal of improving the health and well-being of the American People:

. . . To advance the understanding of biological and behavioral phenomena underlying health, disability and disease (developing the base of science); and

. . . To advance the Nation's capability for the maintenance of health and for the diagnosis, treatment and prevention of diseases (developing and maintaining the system for the generation of new knowledge).

An overriding circumstance which has exerted a dominant influence on scientific activity relevant to health and medicine, is that there is no general, unified body of knowledge and theory encompassing the phenomena of life and the nature of disease and health such as obtains in the physical sciences. Revolutionary progress in the biological and medical sciences remains critically dependent upon the advance of fundamental knowledge and the development of broad and enlightening theoretical concepts. Meanwhile, current research efforts directed toward particular health problems have a high element of empiricism and are surrounded by critical uncertainties. Major advances, therefore, emerge largely in an unpredictable and uncontrollable manner. Thus the opportunities for undertaking large, organized research programs directed toward specific goals remain relatively fewer in number and more limited in scope than, for example, in the physical sciences and engineering.

Despite this limiting circumstance, biomedical research has always had, and will have in the future, a large proportion of practical and problem-oriented activity. This is due to the intrinsic character of the medical sciences, pervaded as they are by a concern for achieving mastery over the untoward conditions and hazards of human life.

It is recognized that there are not definitive measures of output from the research program and that there are no absolute and quantifiable requirements. It is difficult to directly couple the investment in a given kind of research to the objective which is eventually served. The sought for goal is the prevention or eradication of a given disease and we work toward this incrementally--and the bench marks along the way are not precisely measurable

in many respects. While we plan and think in terms of investing in research in the therapy of cancer and heart diesease, we may in fact create an output of considerable new knowledge for which there are no *units* of measure or the knowledge may turn out to be related to the therapy of Parkinsonism rather than to cancer or heart disease. This kind of interrelationship is amply illustrated in the listing of Institute accomplishments in Section I, A,3 on outputs.

What we have is a best professional judgment on the relevance of the research and the chances of its success in achieving an output of new knowledge which leads to the solution of the problem under study. The processes of making the overall and long-range determinations, and even the more specific selections, are complex, are not amenable to simple cost-benefits or cost effectiveness analysis, but must, for the foreseeable future, be dependent upon judgmental decisions of a most sophisticated kind.

Therefore, we proceed to establish--through the aggregate of our activity--a national system or network of institutions and individuals to engage in the essential research. The basic questions are how best to support the "system" and at what level, and what are the constraints on growth--dollars, people, facilities, ideas and opportunities on the one hand; on the other--what is the magnitude of problems likely to be helped--cancer, heart disease, mental retardation--all big problems and requiring big investments. The crucial exercise is to *match the availability of ideas to the seriousness of the problems and the dollars which can be made available.*

The ultimate national goal is to improve the health of the American people. This is no longer limited to ameliorating the dread diseases but to improving the quality of life through prevention and eradication of disease and through particular attention to the social trends which influence the health and well-being of people. At the general level, the national objective is to invest in a network of research performers (individual investigators and/or institutions) to engage with the solution of the pressing problems of health. At the level of more specificity, there is an extensive series of major national objectives in terms of specific health problems to be attacked; in general, the PPB program structure maps on these objectives according to the domain of interest of the various Institutes and Divisions. We have sought a statement of these from each Institute and Division with an Extramural Program and the individual responses appear in Appendix A, Specific Objectives.

.V. FORWARD PLAN

A. National Goals, Needs and Program Objectives

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. . . To advance the understanding of biological and behavioral phenomena underlying health, disability and disease (developing the base of science); and

. . . To advance the Nation's capability for the maintenance of health and for the diagnosis, treatment and prevention of diseases (developing and maintaining the system for the generation of new knowledge).

An overriding circumstance which has exerted a dominant influence on scientific activity relevant to health and medicine, is that there is no general, unified body of knowledge and theory encompassing the phenomena of life and the nature of disease and health such as obtains in the physical sciences. Revolutionary progress in the biological and medical sciences remains critically dependent upon the advance of fundamental knowledge and the development of broad and enlightening theoretical concepts. Meanwhile, current research efforts directed toward particular health problems have a high element of empiricism and are surrounded by critical uncertainties. Major advances, therefore, emerge largely in an unpredictable and uncontrollable manner. Thus the opportunities for undertaking large, organized research programs directed toward specific goals remain relatively fewer in number and more limited in scope than, for example, in the physical sciences and engineering.

Despite this limiting circumstance, biomedical research has always had, and will have in the future, a large proportion of practical and problem-oriented activity. This is due to the intrinsic character of the medical sciences, pervaded as they are by a concern for achieving mastery over the untoward conditions and hazards of human life.

It is recognized that there are not definitive measures of output from the research program and that there are no absolute and quantifiable requirements. It is difficult to directly couple the investment in a given kind of research to the objective which is eventually served. Our goals are not expressed in terms of only 500,000 dying of cardiovascular disease next year, instead of the annual 1 million, 250,000 suffering a lost, and 250,000 only a little,--but the ultimate goal is essentially eradication of the

disease (viz. polio)--and the bench marks along the way are not precisely measurable in many respects. While we plan and think in terms of investing in research in the therapy of cancer and heart disease, we may in fact create an output of considerable new knowledge for which there are no *units* of measure or the knowledge may turn out to be related to the therapy of Parkinsonism rather than to cancer or heart disease. This kind of interrelationship is amply illustrated in the listing of Institute accomplishments in Section I, A,3 on outputs.

What we have is a best professional judgment on the relevance of the research and the chances of its success in achieving an output of new knowledge which leads to the solution of the problem under study. The processes of making the overall and long-range determinations, and even the more specific selections, are complex, are not amenable to simple cost-benefits or cost effectiveness analysis, but must, for the foreseeable future, be dependent upon judgmental decisions of a most sophisticated kind.

Therefore, we proceed to establish--through the aggregate of our activity--a national system or network of institutions and individuals to engage in the essential research. The basic questions are how best to support the "system" and at what level, and what are the constraints on growth--dollars, people, facilities, ideas and opportunities on the one hand; on the other--what is the magnitude of problems likely to be helped--cancer, heart disease, mental retardation--all big problems and requiring big investments. The crucial exercise is to *match the availability of ideas to the seriousness of the problems and the dollars which can be made available.*

The ultimate national goal is to improve the health of the American people. This is no longer limited to ameliorating the dread diseases but to improving the quality of life through prevention and eradication of disease and through particular attention to the social trends which influence the health and well-being of people. At the general level, the national objective is to invest in a network of research performers (individual investigators and/or institutions) to engage with the solution of the pressing problems of health. At the level of more specificity, there is an extensive series of major national objectives in terms of specific health problems to be attacked; in general, the PPB program structure maps on these objectives according to the domain of interest of the various Institutes and Divisions. We have sought a statement of these from each Institute and Division with an Extramural Program and the individual responses appear in Appendix A, Specific Objectives.

. Program Requirements

1. Realistic Objectives

he area of "increasing knowledge" is a dominant area of Federal ıctivity in the biological and medical institutions. The research ›rograms are the source of revolutionary changes in all aspects of health, and their beneficial effects on the national health scene are most likely to be fundamental, pervasive and of long standing.

Our inability to deal with much serious disease in a definitive manner continues to be a substantial barrier to the reduction in health care costs. Also, our concept of progress is measured less in terms of our past accomplishments than in terms of the rate at which we believe we are reaching our expanding objectives.

The need for the benefits to be achieved through biomedical research is almost unbounded. Similarly, we are far from reaching the limits of scientific opportunities. Accordingly, in preparing realistic estimates of the requirements for biomedical research, we were governed by three major resource constraints—the research facilities which might be anticipated during the period of the plan, the research manpower and the volume of funds which, in our judgment, could be considered as likely to be available. Consistent with these constraints, an average annual rate of growth in NIH research grant support of 16 percent and of general research support grants of 20.4 percent is projected.

Compared to total health expenditures, such anticipated expenditures for medical research would be extremely modest. The health service sector of the economy is expected to grow extremely rapidly during the period of the plan. It is essential that this sector experience considerable innovation and improvement in quantity and quality of services. Yet, even at the proposed growth rate, the proportion of expenditures for research compared to consumption is considerably less than similar proportions found in dynamic and innovative sectors of the economy. It is reasonable to suggest that the level of expenditures for research in health should not be limited, as they would be, to less than five percent of the total health expenditures, but that the investment in research could rise to a level similar to that in venture-type industries, which is closer to 10 percent.

On the other hand, the growth rate would cover the increases expected in prices and wages, and some of the increased costs of rapidly advancing technology and some of the additional costs of new scientists and extending research into new areas of scientific investigation.

We can predict with reasonable certainty that the research manpower for this level of activity will be available. In fact, for the 1970-75 period, the manpower is presently in research, in graduate school or in postdoctoral study. Behind them is a substantially enlarged undergraduate enrollment. Similarly, projections of the health research facilities program, part of the overall plan being presented, have considered the proposed levels of research support.

Perhaps the single most important action which could be taken, at this time, would be to establish the general rules of where the research programs can go over the next five years--whatever the level--and that these ground rules become known with some degree of confidence.

The Office of the Director is in the process of an extensive review of the research programs of the Institutes and Research Divisions. As part of this study, the program directors indicated the scientific problems for which program solutions were needed; the recent accomplishments in that area; the opportunities for scientific advancement; the impediments to future advance, such as the insufficiency of the scientific base or the shortage of the facilities or manpower; the recent level of efforts; the proposals for levels of activity over an extended period; and justification for such proposed levels.

The programs are considered as consisting of two major components, the basic or regular research programs which are necessary for the maintenance and further development of the essential scientific base of knowledge and the identification of areas to be specially developed; and areas which warranted special emphasis through administrative arrangements or funding.

The program proposals are evaluated, and determination made of the optimal level of activity for each of the major programs which would be consistent with an overall rate of growth considered feasible for NIH research activities in support of Increasing Knowledge. Priority in this allocation will be given to those programs which display the greatest potential for scientific and social benefit and the highest likelihood of achieving these benefits. It is important to note that in order to achieve the

optimal levels for programs to be specially emphasized, within the overall ceiling, that it will be necessary to hold the basic or regular programs to their 1970 level of activity, with only those adjustments which are necessary to cover the minimum increases in costs.

2. *Alternative objectives.*

In preparing an alternative program level which would maintain program activity, the only adjustments which were made were those considered absolutely essential to cover the seven to eight percent increase in prices of materials used in performing research activities. This figure is undoubtedly lower than the probable increases in medical care costs (an important ingredient of clinical research) and insufficient for the increased wages needed to retain and attract quality employees.

It must be emphasized that if resources are not available, and it is necessary to maintain program coverage at a constant FY 1970 level, then the net result will be a cutback in output. There would be insufficient funds to cover the inflation relative to salaries, and the advance of individuals as they climb the academic ladder. Further, cutbacks would occur in some programs to offset the increasing costs in certain disciplines requiring constantly more elaborate, complex and expensive equipment. Support for new investigators would become very limited, there would be no opportunity to invest in new areas, and the incentive for high-risk, but possibly big pay-off investment, would be virtually non-existent. Undoubtedly, priority would tend to be placed more and more on organized, more highly directed research because of the illusion that results would be more definitive on a more compressed time frame. The regular program which reflects maximum initiative on the part of the scientific community would be restricted disproportionately.

In sum then, the issues involved are:

. . . the degree of initiative or control exercised by the Federal Government on the programs, and conversely the responsiveness of these programs to the dynamics of the scientific community;

. . . the relative size of the effort directed toward support of the relatively undifferentiated science base, for developing new scientists and new scientific areas, and for consolidating scientific advances already achieved;

. . . the distribution of effort between current programs and investments in resources for future operations; and

. . . the problems of maintaining and developing these programs in the face of sustained restricted funds.

C. Budget Projection--Dollar Requirements to Meet the Above Needs at Both the Realistic Level (B.1.) and the Alternative Level (B.2).

1. *Using present administrative and legislative structure.*

2. *Indicate alternative methods for meeting needs, cost data for each alternative and an indication of preferred alternative.*

(SEE PAGES 57-62)

1968 - 1975
(in millions of dollars)

	1968	1969	1970	1971	1972	1973	1974	1975
National Library of Medicine	17	20	20	68	77	86	94*	98
Grants	7	8	6	22	25	28	30	31
Direct Operations	10	12	14	21	27	33	38	42
Construction Grants				25	25	25	25	25
Institutes and Research Divisions	1,088	1,108*	1,080*	1,568	1,828	2,108	2,420	2,782
Research	800	819	831	1,042	1,246	1,450	1,688	1,967
Research Grants	562	563	572	685	815	933	1,074	1,239
General Research Support Grants**	60	61	61	100	125	155	182	210
Research Contracts	103	113	115	150	179	217	264	322
Other Direct Research Operations	75	82	83	107	127	145	168	196
Training and Fellowships	187	198	179	326	363	408	456	508
Construction (HRFC)	38	21	-	120	127	141	148	160
Research Supporting Activities	63	72	72	80	92	109	128	147
Buildings and Facilities	4	15	4	28	45	11	3	1

* Discrepancy due to rounding
** Includes NIMH contribution to GRSG

NIH, NLM Program and Financial Plan
Realistic Plan
1968 - 1975
(1969 = 100)

	1968	1969	1970	1971	1972	1973	1974	1975
National Library of Medicine	85.0	100.0	100.0	340.0	385.0	430.0	470.0	490.0
Grants	87.5	100.0	75.0	275.0	312.5	350.0	375.0	387.5
Direct Operations	83.3	100.0	116.7	175.0	225.0	275.0	316.7	350.0
Construction Grants				*	*	*	*	*
Institutes and Research Divisions	98.2	100.0	97.5	141.5	165.0	190.2	218.4	251.1
Research	97.6	100.0	101.5	127.0	151.8	176.7	205.7	239.6
Research Grants	99.8	100.0	101.6	121.7	144.8	165.7	190.8	220.1
General Research Support Grants**	98.4	100.0	100.0	163.9	204.9	254.1	298.4	344.3
Research Contracts	91.2	100.0	101.8	132.7	158.4	192.0	233.6	285.0
Other Direct Research Operations	91.5	100.0	101.2	130.5	154.9	176.8	204.8	239.0
Training and Fellowships	94.4	100.0	90.4	164.6	183.3	206.1	230.3	256.6
Construction (HRFC)	181.0	100.0	--	571.4	604.8	671.4	704.8	761.9
Research Supporting Activities	87.5	100.0	100.0	111.1	127.8	151.4	177.8	204.2
Buildings and Facilities	26.6	100.0	26.6	186.7	300.0	73.3	20.0	0.1

* Zero dollars in base year
**Includes NIMH contribution to GRSG

Average Annual Increase

	1970 to 1971	1970 to 1975	1971 to 1975
National Library of Medicine	240.0	37.4	9.6
Grants	266.7	38.9	8.9
Direct Operations	50.0	24.6	18.9
Construction Grants	*	*	0.0
Institutes and Research Divisions	45.2	20.8	15.4
Research	25.4	18.8	17.2
Research Grants	19.8	16.7	16.0
General Research Support Grants**	63.9	28.0	20.4
Research Contracts	30.4	22.8	21.0
Other Direct Operations	28.9	18.7	16.3
Training and Fellowships	82.1	23.2	11.7
Construction (HRFC)	*	*	7.4
Research Supporting Activities	11.1	15.3	16.4
Buildings and Facilities	600.0	-15.0	-24.1

*Zero dollars in 1970
**Includes NIMH contribution to GRSG

NIH, NLM Program and Financial Plan
Alternative Plan
1968 - 1975
(in millions of dollars)

	1968	1969	1970	1971	1972	1973	1974	1975
National Library of Medicine	17	20	20	22	24	26*	28	30
Grants	7	8	6	7	8	8	9	10
Direct Operations	10	12	14	15	16	17	19	20
Institutes and Research Divisions	1,088	1,108*	1,080*	1,219	1,315	1,418	1,528	1,649
Research	800	819	831	908	974	1,044	1,119	1,199
Research Grants	562	563	572	612	655	701	750	803
General Research Support Grants**	60	61	61	65	70	75	80	86
Research Contracts	103	113	115	124	134	145	157	169
Other Direct Research Operations	75	82	83	89	99	107	117	127
Training and Fellowships	187	198	179	209	231	257	284	314
Construction (HRFC)	38	21	-	44	47	50	52	58
Research Supporting Activities	63	72	72	76	79	83	88	92
Buildings and Facilities	4	15	4	7	2	1	1	1

* Discrepancies due to rounding

**Includes NIMH contribution to GRSG

Alternative Plan
1968 - 1975
(1969 = 100)

	1968	1969	1970	1971	1972	1973	1974	1975
National Library of Medicine	85.0	100.0	100.0	110.0	120.0	130.0	140.0	150.0
Grants	87.5	100.0	75.0	87.5	100.0	100.0	112.5	125.0
Direct Operations	83.3	100.0	116.7	125.0	133.3	141.7	158.3	166.7
Institutes and Research Divisions	98.0	100.0	97.5	110.0	118.7	128.0	137.9	148.8
Research	97.7	100.0	101.5	110.9	118.9	127.5	136.3	146.4
Research Grants	99.8	100.0	101.6	108.7	116.3	124.5	133.2	142.6
General Research Support Grants**	98.4	100.0	100.0	106.6	114.8	123.0	131.1	141.0
Research Contracts	91.2	100.0	101.8	109.7	118.6	128.3	138.9	149.6
Other Direct Research Operations	91.5	100.0	101.2	108.5	120.7	130.5	142.7	154.9
Training and Fellowships	94.4	100.0	90.4	105.6	116.7	129.8	143.4	158.6
Construction (HRFC)	181.0	100.0	*	209.5	223.8	238.1	247.6	276.2
Research Supporting Activities	87.5	100.0	100.0	105.5	109.7	115.3	122.2	127.8
Buildings and Facilities	26.6	100.0	26.6	46.7	13.3	7.0	7.0	7.0

* Zero dollars in 1970

**Includes NIMH contribution to GRSG

INCREASING KNOWLEDGE
NIH, NLM Program and Financial Plan
Alternative Plan
1968 - 1975
Average Annual Increase

	1970 to 1971	1970 to 1975	1971 to 1975
National Library of Medicine	10.0	8.4	8.1
Grants	16.7	10.8	9.3
Direct Operations	7.1	7.4	7.4
Institutes and Research Divisions	12.9	8.8	7.8
Research	9.3	7.6	7.2
Research Grants	7.0	7.0	7.0
General Research Support Grants**	6.6	7.1	7.2
Research Contracts	7.8	8.0	8.0
Other Direct Research Operations	7.2	8.9	9.3
Training and Fellowships	16.8	11.9	10.7
Construction (HRFC)	*	*	7.1
Research Supporting Activities	5.5	5.0	4.9
Buildings and Facilities	75.0	-15.0	-21.4

* Zero dollars in 1970
**Includes NIMH contribution to GRSG

). Legislative Requirements for the preferred Forward Plan

1. *Extension of existing legislation needed.*

The research contract authority in the Public Health Service Act (Section 301(h) will expire on June 30, 1971, unless it is extended some time before then.

2. *Extension needed with amendments.*

None.

3. *New legislation needed.*

None

4. *Administrative actions needed.*

None.

PART I. - NIH EXTRAMURAL RESEARCH

APPENDIX A.

SPECIFIC OBJECTIVES

NATIONAL CANCER INSTITUTE

Control of cancer in the United States - approximately 600,000 mericans will develop cancer in 1969, and over 300,000 Americans will ie of Cancer in 1969.

1. Cancer Etiology - viruses, chemicals and radiation have all been shown to be etiologic agents for certain cancers. Successful identification of the causes of human cancers will be followed by appropriate control mechanisms.

2. Cancer Therapy - Until such time as the causes of human cancer are identified and eliminated, it will be necessary to provide all Americans who have cancer with the very best therapy known and to strive continually to improve that therapy.

   a. Improve surgery, radiotherapy and chemotherapy.

   b. Evaluate combinations of above therapies.

3. Increase the number of comprehensive cancer research and treatment facilities in appropriate geographic settings so as to provide each American with optimum diagnostic and treatment facilities for cancer.

NATIONAL HEART INSTITUTE

The research programs of the National Heart Institute are aimed t increasing scientific and medical knowledge of the cardiovascular ystem and at the prevention or relief of the large family of diseases hat afflict it. The cardiovascular diseases, collectively, are he most pressing health problem of our time. They claim more than 1 illion lives annually, partially or completely disable more than .5 million others each year, and cost the Nation nearly $30 billion nnually in lost wages, reduced productivity and medical care costs.

1. Arteriosclerosis, our Nation's leading health problem, is probably present to a greater or lesser degree in most American adults. Its artery-clogging deposits are the major underlying cause of heart attacks, strokes and a host of other disorders.

The major thrusts of the NIH research efforts are (a) identifying causes of arteriosclerosis; (b) seeking effective means of prevention; and (c) developing effective methods of treating the varid manifestations of the established disease.

Research has identified major factors increasing susceptibility to arteriosclerosis. Countermeasures, such as lipid-lowering diets and drugs, have been developed against a number of these, but their long-term effectiveness remains to be assessed. There is presently no cure for arteriosclerosis; and, though the management of such consequences as heart attacks and strokes has improved, arteriosclerosis still contributes importantly to more than 800,000 deaths per year.

2. Coronary Heart Disease, the most devastating of the cardiovascular disorders, afflicts an estimated 3.1 to 5.6 million adults and causes nearly 600,000 deaths a year.

Research programs place heavy emphasis on prevention, but also on more effective means of treatment--particularly of the acute heart attack. The Myocardial Infarction Program is primarily concerned with increasing medical knowledge of acute heart attacks, improving all phases of patient care, and seeking means to avert the sudden death that overtakes many heart attack victims before medical assistance can reach them. The heart attack patient will also be the major beneficiary of heart-assist devices and techniques being developed by the Artificial Heart Program. The Coronary Drug Project is aimed at protecting recovered heart attack patients against recurrent attacks.

Treatment has improved. Thousands of victims of angina pectoris ıre benefiting from better pain-relieving drugs and surgical techniques :o improve the blood supply to the heart. Continuous monitoring techniques :oupled with improved emergency drugs and resuscitation procedures have ;ubstantially increased survival among hospitalized heart-attack patients. This intensified effort may well reverse a mortality trend that has been :elentlessly upward for many years.

3. Hypertension and Kidney Diseases, afflict from 17-22 million adults. Modern blood-pressure drugs permit effective control of hypertension and have nearly halved the death rate from hypertension during the past 10 years; however, there is still no cure nor are there effective preventive measures.

Research is centered on (a) identifying the cause or causes of essential hypertension; (b) developing improved techniques for the diagnosis and treatment of potentially curable forms of secondary hypertension; and (c) clarifying blood pressure control mechanisms.

Progress has been made against hypertension; but until present palliative measures are supplanted by effective means of prevention or cure, the disease will remain a major health problem.

4. Thrombosis and Hemorrhagic Diseases, collectively, are probably the single most important problem posed by the cardiovascular diseases. Clotting complications of cardiovascular diseases are directly responsible for the great majority of their disabling or lethal consequences, such as heart attacks and strokes. At the other end of the scale, hemorrhagic disorders, such as hemophilia, afflict an estimated 100,000 Americans and constitute an inordinately heavy drain on the Nation's blood supply.

Research programs emphasize (a) basic studies on the body's coagulation and clot dissolving mechanisms; (b) improved methods of diagnosis for coagulation disorders; (c) the development of agents permitting manipulation of coagulation and clot-dissolving mechanisms to the benefit of patients; and (d) improving all phases of technology relating to the processing, storage, and distribution of blood and blood products for medical and research purposes.

Major advances stemming from this research have been effective anticoagulant and clot dissolving agents; the development of clotting factor concentrates for preventing or controlling bleeding episodes of hemophilia and related diseases; and specific blood and plasma fractions for a variety of blood-deficiency conditions.

5. Stroke causes more than 200,000 deaths annually and partially or completely disables more than twice as many others.

Research programs emphasize (a) the identification of factors increasing risk of stroke and the development of effective countermeasures against salient risk factors; (b) the development of reliable diagnostic measures for differentiating among various forms of stroke; and (c) development of effective therapeutic measures, with emphasis on the prevention or relief of strokes due to surgically accessible obstructions of the cerebral blood vessels.

Advances in these and other areas of stroke research have reduced overall stroke mortality by 11 percent (and by 20 percent among persons under 65) over the past 10 years. Moreover, more effective rehabilitation procedures have substantially reduced the toll in disability formerly exacted by stroke.

6. Heart Failure, acute or chronic, is a consequence of numerous congenital or acquired cardiovascular disorders. Acute heart failure is a common and often lethal complication of heart attacks. Chronic heart failure is a common long-term consequence of uncontrolled hypertension, heart attacks, and various rheumatic and congenital heart disorders. The annual mortaility from both forms exceeds 1.0 million deaths.

Research programs are directed toward (a) a fuller understanding of mechanical, biochemical, and related factors affecting circulatory-system performance; (b) the development of cardiac stimulants, anti-arrhythmic drugs, circulatory assist devices, artifical pacemakers, and related techniques for the temporary or long-term improvement of heart performance; and (c) the development of effective means of combatting shock, abnormal fluid retention, and other complications of acute or chronic heart failure.

The management of chronic heart failure has been improved dramatically by the development of a variety of effective cardiac stimulants for augmenting the performance of a failing heart and diuretics for preventing or controlling abnormal fluid retention. Acute heart failure and shock developing in the wake of heart attacks still carries an appalling mortality; but hopes are high that circulatory-assist devices currently under development will substantially reduce this toll.

7. Congenital and Rheumatic Heart Disease remain major health problems despite substantial research progress. Between 30,000 and 50,000 infants are born each year with congenital heart defects, and congenital heart disease is still the leading cause of death in infants under 2 years;

ve prompt diagnosis of those defects requiring partial or total correction plus the fullest application of existing surgical techniques ould cure or improve an estimated 75 percent of these cases. Similarly, e fullest application of existing preventive and corrective techniques ould, in theory, eliminate rheumatic heart disease as a major health oblem; yet, although medical science has reduced mortality by 3 percent over the past 10 years, it is still tragically short of is goal.

Research programs are (a) to ascertain potentially preventable uses of congenital heart disease; (b) increase the salvage rate among fants born with congenital defects through continued improvements in agnostic and surgical techniques; (c) develop means for identifying and otecting individuals highly susceptible to rheumatic fever; and) improve the medical therapy of acute rheumatic fever episodes and e surgical repair of permanent heart damage.

8. Respiratory Diseases, such as chronic bronchitis and emphysema, use more than 25,000 deaths annually, afflict at least 2 million and ssibly as many as 14 million adults, and rank second only to heart sease as a cause of disability.

Research is directed toward (a) identifying the cause o causes emphysema, still unknown, and developing effective means of prention; (b) devising effective, widely applicable techniques for the rly detection of chronic respiratory diseases in patients who have t yet experienced symptoms; and (c) developing drugs, respiratory sist techniques, and other measures to alleviate the distressing mptoms of these disorders.

Research has identified a number of factors--recurrent respiratory fections, smoking, air pollution, and others--that predispose to physema; and a variety of effective diagnostic procedures have been vised. But the damage already done by the disease cannot be remedied, d present methods of treatment leave much to be desired.

NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES

1. Transplantation and Related Immunology. Research in fundamental mechanisms of cellular immunity and rejection of foreign tissue and tissue typing technique, with special reference to organ transplantation.

2. Acute Respiratory Infections. Research leading to the prevention of selected viral and bacterial diseases of significant public health importance--development of vaccine against pneumococcal penumonia, infant pneumonias due to respiratory syncytial virus, and other respiratory diseases caused by mycoplasma, adenoviruses, and influenza viruses. (Acute respiratory diseases (primarily viral) cause 500 million cases of common cold per year, cost $3 billion for lost time, and cause 70 percent of all infectious disease deaths, or about 75,000 per year.)

3. Allergic and Immunologic Diseases. Research leading to the recognition, definition, treatment and prevention of a wide range of disorders due to abnormalities of the immune response mechanism. (Well recognized are hay fever (16,000,000 sufferers in the U.S.) and asthma (6,000 deaths per year).)

4. Interferon and Other Antiviral Substances. Research leading to prevention and treatment generally applicable to a wide range of virus diseases including the majority of acute respiratory infections (v.i.) and life-threatening diseases such as epidemic viral encephalitis.

5. Chronic and Degenerative Diseases of Microbial Origin. Research on the causation, treatment and prevention of a series of diseases including emphysema and chronic bronchitis, and diseases of the nervous system (e.g., multiple sclerosis) or connective tissue (e.g., rheumatoid arthritis) or kidneys. (There are nearly 5 million cases of emphysema in the U.S., and these account for 26,000 deaths annually. Emphysema ranks second to heart disease as a cause of disability.)

6. Biochemical and Physiological Base for Disease Research. Research to elucidate at the cellular and molecular level, problems raised by infectious and immunologic diseases, including host-parasite interactions.

7. Infectious Hepatitis. Research on diagnosis, prevention and treatment of a disease responsible for nearly 40,000 cases per year and a constant threat to any one receiving a blood transfusion. No specific cause has been identified, nor is a vaccination or specific treatment available.

8. Drug Resistance and Microbial Disease. Research leading to an understanding of why bacteria become resistant to the effects of antibiotics and therapeutic drugs and the explanation of the mode of action of antibiotics and their clinical evaluation. (Diseases caused by virtually every species of bacteria may be complicated by resistance and with some species (e.g., staphylococci, meningococci, and gram negative rods) the problem is acute, particularly in hospital patients already debilitated by another disease.)

9. Congenital Defects Caused by Microbial Agents. Research on the role specific organisms play in the causation of birth defects; and the prevention and treatment of these infections. (Three to seven per cent of all U.S. live births show defects--approximately 25 percent of these are hereditary and an additional 15 percent are due to known external causes, including rubella. Rubella in a recent epidemic year caused 30,000 abnormal children resulting in an expected expenditure of $3 billion for rehabilitation.)

10. Regional Disease Problems. Research on infectious diseases particularly important in certain geographic areas of the world. This program is strongly oriented to practical means of control and prevention. (The diseases concerned include tuberculosis (about 45,000 cases annually in the U.S., and over six million cases worldwide), cholera (over 500,000 cases worldwide), schistosomiasis and filariasis (over 250,000 cases each).)

NATIONAL INSTITUTE OF ARTHRITIS AND METABOLIC DISEASES

1. Arthritis and Rheumatic Diseases. Research on the relationship (infectious agents to these diseases and of immune mechanisms; on egenerative changes which alter the mechanical structure of the joints, ad the metabolic defects responsible for increased amounts of uric cid in the body of the gouty patient. (Rheumatoid arthritis, osteo-rthritis and gout, afflict more than 16 million people in the United tates and are estimated to affect adversely the economy by about 3.6 billion annually.)

2. Metabolic Diseases. Research on the cause of diabetes; exploration f the biochemical aberrations active in a number of the other metabolic iseases, e.g., cystic fibrosis, phenylketonuria, galactosemia, alcaptonuria, istidinemia, Wilson's disease, and others, will occur along with effects oward finding new and reliable methods of diagnosis and therapy. Diabetes afflicts three million Americans, with another five million who ill develop the disease during their lifetime; cystic fibrosis has an ncidence of one in 1,500 live births.)

3. Endocrine Disorders. Research on the precise mechanisms by which ormones influence metabolism; on the molecular structure of hormones and heir synthesis; continued effort to increase the availability of pure nd potent preparations of hormones from natural sources. (Osteoporosis, haracterized by a gradual decrease in both the amount and strength of one tissue, is one of the major causes of disability in old age, especially n women. An estimated 5,000 to 10,000 American children suffer from ypopituitary dwarfism, a condition resulting from insufficient human rowth hormone.)

4. Gastrointestinal Diseases. Research on the function of gastrointestinal tract organs, and on nutritional diseases, including malnutrition and deficiency diseases. (Peptic ulcer which afflicts some 14 million Americans, with 4,000 new cases reported daily, costs the economy about $500 million annually. Other chronic digestive conditions, such as ulcerative colitis, liver disease, gallbladder disease, strike countless other Americans; the number of obese Americans has been estimated at 40 million.)

5. Urologic and Kidney Diseases. Research kidney function and the pathogenesis and etiology of kidney disease, on tissue matching, organ storage and surgical techniques to make kidney transplantation a standard and relatively permanent therapeutic measure; on a more efficient and less costly artificial kidney than those in current use to make it available to an estimated 9,000 persons annually. (Glomerulo-nephritis (Bright's disease) and nephrosis kill an estimated 57,000 Americans each year.)

6. Disorders of the Blood and Blood Forming Organs. Research on the formed elements of blood--red cells, white cells and platelets and on the diagnosis and therapy of the anemias and other hematologic diseases. (The number of American afflicted with diseases in this category is estimated at more than one million.)

7. Skin Diseases. Research on basic skin physiology, pathology and therapy of skin disorders including such diseases as psoriasis (,000,000 victims), atopic dermatitis, pemphigus, discoid lupus erythematosis, and skin disorders endemic in the tropics.

NATIONAL INSTITUTE OF CHILD HEALTH AND HUMAN DEVELOPMENT

1. Early Childhood Development. The quality of life and educability of our children must be increased through a major research effort resulting in better understanding of optimal human development, with particular emphasis on the behavioral and biological aspects of early childhood. Identification of factors having adverse effects on development is important so that effective remedial efforts will have high prospects of blunting the impact of deprivation.

2. Infant Mortality. In 1967, in the United States approximately 78,000 infants died in the first year of their lives. Reduction of this appalling infant mortality rate of 22 infants per 1,000 live births is mandatory; mobilization of the resources of science could halve this rate in five years.

There are 12 major nations with infant mortality rates lower than those of the U.S.A. There has been a six percent rise in the last five years in this country in the numbers of infants of low birth weight who comprise over 70 percent of infants dying in the first month of life. We must examine the causes of infant mortality and eliminate the multiple factors involved. Such factors include causation of prematurity, respiratory distress syndrome, sudden death of infancy, congenital malformations, psychosocial deprivation, and socioeconomic considerations.

3. Population Research. The population of the world will double by the year 2,000, and the U.S.A. will contain more than 300 million people by that time. Contraception is an indispensable adjunct to the control of population growth; we must develop an array of safe, effective, acceptable, inexpensive contraceptive methods for regulation of family size and child spacing. The underpinning of this program will be research in the fundamentals of reproductive biology.

4. Mental Retardation. One hundred thousand infants born each year in the United States are destined to be mentally retarded in some degree; six million people in the U.S.A. are today mentally retarded. The social implications of these facts require research into the causation, diagnosis, prevention, treatment, management, and amelioration of this tragic condition.

5. Malnutrition. One-fourth of our children, and one of every three children under six years of age, live in homes with insufficient incomes to buy life essentials. Malnutrition to some degree must therefore exist in a high proportion of these deprived children. Research on the effects of maternal and child malnutrition upon growth, intellectual development, is essential to elimination of the problem.

6. Aging. Ten percent of the U.S. population, about 20,000,000 .
;ons, are over 65 years old. This segment of the population suffers
.gh degree of functional disability which is both directly and indirectly
ited to the biological processes of senescence. Those processes begin
later than early adulthood and gradually transform the young adult into
elderly person. They produce disability in themselves and contribute
vily to the development of the major diseases of the elderly. Research
these biological processes must be conducted if medical science is to
ve the physical needs of the elderly.

The elderly have many psychological problems that arise in the
rse of adjustment to the physical, mental, social and economic losses
the later years. Research is needed on those factors which make
sible a comfortable and socially useful old age and permit the aging
live in the community, thus avoiding the expense and heartache of
titutional life.

NATIONAL INSTITUTE OF DENTAL RESEARCH

The overall objective is to contribute to better control and treatment and to prevent a variety of oral disorders.

The proper functioning and state of health of the oral cavity contribute importantly to the individual's physical, mental, and social well-being. They not only are indispensable to nutrition and communication but they also influence the general health of the body.

Of the total annual dental bill paid by private citizens for dental care accounts approximate $3.7 billion. This cost is distributed principally among the three major dental health problems of caries (tooth decay), periodontal diseases, and abnormalities of oral-facial development and function including cleft palate, malocclusion, and related disorders. An estimated 100 million man-hours are lost each year as a consequence of dental disease. This represents a calculated cost of $293 million in earnings. It is estimated that if all individuals requiring treatment for dental and oral diseases were to receive it, the cost for the first year alone would be in the range of $20 to $25 billion.

1. Caries. Complete prevention of dental caries, a disease affecting 98 percent of the American population.

Starting in infancy, the ravages of this practically universal problem extend into the adult years. Caries not only cause loss of teeth directly but also contribute to periodontal disease with further tooth loss, as well as functional and cosmetic problems associated with malocclusion. Its impact on productivity is best documented in the experience of the Armed Forces. One out of every eight men fighting in Vietnam has to be pulled out of the line, for up to five days, because of some dental emergency. Of these, more than 80 percent are the result of decayed teeth which have to be extracted or restored. For every 100 inductees, the Armed Forces provide 500 fillings, 80 extractions, 25 bridges, and 20 dentures.

Elimination of caries as a public health problem would free at least half the average dentist's time and realize an annual saving of about one billion dollars in patient costs.

2. Periodontal Disease. Improved treatment and control and ultimate revention of the principal cause of tooth loss after age 35 years.

Although some scientists believe that periodontal disorders have their ncipiency in the teens, their destructive impact is most clearly iscernible in middle age. Of the 90 million adults in the United States no retain at least some of their teeth, 67 million have some sign of his disease and 20 million have advanced stages of disease. Largely, a consequence of periodontal disease, an additional 20 million dults have lost all their teeth.

Malnutrition, in turn contributing to a breakdown in general health, s a frequent concomitant of advanced periodontal disease. Until dentures an be perfected and further loss of bone structure in the jaws arrested, he loss of teeth to periodontal disease imposes a serious handicap on he individual affected.

3. Cleft Lip/Palate. To help victims achieve near-normal appearance, peech, and function and to reduce the incidence of these congenital alformations which now affect one of every 800 children born each year n the United States.

Cleftlip/palate comprises 13 percent of all reported birth anomalies n the United States. Today, more than a quarter of a million persons n this country have some form of mouth cleft. This year, over 6,000 ew victims and their families will need help to bear heavy medical, sychological, and financial burdens.

A severe cleft not only makes swallowing and speaking difficult, but t also increases the danger of ear infections and deafness. It also poses severe psychological problems, as illustrated by studies which report that clefted children prefer any other type of crippling to their deformity.

Because of the nature of the problem and the need to relate certain aspects of treatment to growth and development patterns, a protracted period of care is required, involving a team of specialists. Thus, current expenditures for hospitalization, surgery, orthodontic care, speech training, etc., in a single case of cleft lip/palate covering the period from birth to 16 years, ranges from $5,000 to $15,000. Accordingly, the prospect of an eventual elimination of this congenital anomaly would bring an annual saving of about $45 million in patient costs for treatment.

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES

1. Development of a national network of university centers of search and training in environmental health sciences.

2. Establishment of Standards. Provide scientific data for the velopment of improved criteria to serve as a basis for the establishment standards which more adequately control the health hazards associated th exposure to environmental agents.

3. Problems associated with Smoking. Determination of basic biological chanisms through which man's health is adversely affected by smoking and aluation of the contribution of various components of cigarette smoke order to provide the information required for the development of a ss hazardous cigarette and other means of reducing the risks to man sociated with the use of tobacco.

4. Mycotoxins. Undertake an environemtnal and biological profiling mycotoxins and other natural products for the purpose of identifying ose which should be controlled in water and food used for domestic imals and human consumption.

5. Environmental Factors and Lung Disease. Studies of the reaction f the lung to asbestos and other fibers inhaled by the general population s well as those exposed industrially, including the production of esotheliomas and other tumors.

6. Effects of Trace Elements. Determine the means by which exposure o trace elements can result in adverse health effects in order to make ossible the development of standards for public health control.

7. Pesticides. Determine the means by which pesticides and their ynergists cause adverse effects in man in order that corrective measures an be developed.

NATIONAL INSTITUTE OF GENERAL MEDICAL SCIENCES

The National Institute of General Medical Sciences supports abroad base of fundamental and applied biomedical research activities amed at the solution of certain major health problems. Specific rogrammed research objectives are to develop new knowledge for sfer and more effective use of drugs, to understand the genetic basis c disease, to improve health services through the application of ngineering knowledge to medical care, and to provide better diagnosis ad therapy in medicine. The research effort in the fundamental sciences s designed to provide a foundation for understanding disease processes ad to furnish a unifying strand of basic information to the disease-riented program of NIGMS and the other Institutes of NIH.

. Clinical Sciences

1. Trauma - Trauma, the Nation's fourth leading cause of death and isability and the leading cause of death of young people between the ages f one and 35, is under attack in the NIGMS which has now started six enters for trauma research. The present center programs are concentrating n the detrimental metabolic changes in the injured patient, on biochemical hanges at the cellular level in order to determine what happens to injured issues and how they heal. Major advances have been made in these areas n the past year. Other investigators are studying infection as a result f burns or decreased resistance due to other major or multiple injuries. he use of on-line computers is being explored for the constant assessment f severely injured patients. Psychiatrists in one center are studying he behavioral responses to injury to try to determine why some people eact poorly to a sudden physical disability.

The pathology and physiology of trauma also is being investigated. ertain symptoms may become predictable in relation to specific pathological njuries and this knowledge would aid the clinician with the minute-to inute decisions that he must make--decisions which often are critical n life threatening conditions. The individual research projects in ddition to supplementing the center studies are also concerned with ifferent phases of shock, the repair of tissues and wound healing, treatment of burns, rehabilitation, prosthetic devices, and drowning.

2. Anesthesiology and Diagnostic Radiology Research Centers. These centers provide a focus for a coordinated program of research on man and animals. A center substantially increases and improves an institution's and a region's research productivity because it can attract top-flight scientists in different disciplines to work on the activities of the center.

3. Anesthesiology. The modern specialty of anesthesiology is oncerned with far more than rendering a patient unconscious so that other-ise painful procedures can be carried out. The anesthesiologist, because f his special combination of skills in clinical and related fundamental ciences, is concerned with all aspects of pain control, with the management f the unconscious patient from any cause, the treatment of respiratory mergencies, resuscitation, inhalation therapy, post-operative care, and any other problems.

4. Diagnostic Radiology. The central and essential role of diagnostic radiology in clinical medicine is well known. The diagnostic radiologist functions primarily in the hospital setting where his service to every specialty creates a heavy work load which together with his need for very expensive, complex equipment makes research difficult. Nevertheless, new techniques and new approaches are essential if the radiologist is to meet the increasing demands for his services both in terms of the numbers of examinations required and the new types of procedures which should be developed. The NIGMS supports research to improve diagnosis through new instruments and computerized systems and to widen the range of techniques available to the clinician including such special procedures as autoradiography and thermographic analysis of body heat radiation patterns to establish the existence of tumors, blocked blood vessels, or other abnormal conditions.

5. Automated Clinical Laboratories. The analysis of samples for diagnostic treatment from human patients has not received the full benefit of basic research. The program in Automation in the Clinical Laboratory is an attempt to bridge the gap between this basic research and provision of adequate economical medical care.

The goal is the development of a completely automated laboratory. Completely automated systems do not exist at present although there are a number of partially automated systems in use. The program will concentrate on the development of new analytical tools and methods, and the development of automated systems for the rapid and accurate testing of biological fluids. These together with the development of appropriate computer hardware and appropriate controls for analytical methods will lead to the assemblying of a completely automated laboratory. It is anticipated costs to the patients will be reduced through lower laboratory fees and shorter stays in the hospital; laboratory studies should become more accurate and reliable.

6. Pharmacology Toxicology. The Pharmacology Toxicology program as as its ultimate objective the improvement of medical therapy through better understanding of drug action and the factors which influence he response of the patient. As one of the major needs for medical care he Pharmacology/Toxicology Program is investigating how best to se existing drugs so as to produce maximum therapeutic benefit with the east risk of adverse effects.

7. Bioengineering Sciences. The program in biomedical engineering ncompasses the applications of mathematical and physical sciences, including ngineering sciences, to biomedical problems, and of engineering methodology o problems of processing medical information. It combines the mathematical kills, and the analytical ability of the engineer with the knowledge and nderstanding of biological systems by the life scientist, in order to ocus upon the solution of engineering problems associated with living systems nd with health care.

8. Behavioral Sciences. Studies on the role of behavior and social nvironment in illness, and the patient's behavioral response to his illness ill provide a basis for application of this important science in medical are and medical training. Although most of the research on behavior s carried on outside the medical environment, a major thrust of the NIGMS rogram will be the application of behavioral science knowledge and skill n the hospital and the medical school.

3. Fundamental Sciences. The fundamental sciences program of NIGMS nterrelates the biological, biochemical and biophysical sciences. The nifying theme is one of gaining comprehensive understanding of life processes as they function in health and disease. A large part of these investigations are conducted at the subcellular and molecular level where it is highly probably that the answers to most serious disease problems will be found. The information gained here is fed into the more applied areas of research and in turn information from the clinic is fed back to speed basic discovery. There are three major areas of attack: (a) how the cell reproduces and the defects which occur when such reproduction is faulty--this is the field of genetics; (b) how the cell is able to perform its myriad of activities in order to understand how changes occur in disease--this is the area of cell biology; (c) how the organism or the cell is able to respond to its environment as a unit or as a society--this is the study of adaptability.

1. Genetics. The program seeks to improve health by understanding the role of human heredity in health and disease. It is known that genetic factors play a major role in the more common diseases which affect man which implies that a better understanding of genetics will help prevent some of the human suffering caused by genetic disorders.

Work in human genetics at several centers is providing new nformation on the rejection phenomena in transplantation of organs hrough fundamental research on human genetics and immunochemistry. ytogenetic and chromosomal studies also are necessary to determine hich environmental or genetic factors predispose to chromosome bnormalities and how the chromosomes, normal and abnormal, behave and unction during human differentiation and development.

The Institute is also concerned with the mutagenic properties of rugs and is investigating this complex problem through both grants and ontracts. It is concentrating heavily on common drugs (caffeine) hich have known mutagenic activity in lower organisms.

Even with improved methods, genetics research will not be soon ompleted. The realization that mammalian cells may each accommodate one illion separate genetic messages in their approximately six feet of louble-helical deoxyribonucleic acid (DNA) and the realization that thus ar scientists have been able to recognize only about 1,000 gene markers as made the progress of geneticists to date seem small indeed.

The need for further research is enormous; to give one example the oncept that the cancerous alteration of cells is associated with lteration of their genetic material and that such altered cells, in urn, pass on to their offspring the genetic defects and the resultant ancerous features must be investigated.

2. <u>Genetic Chemistry</u>. The program in Genetic Chemistry complements the Genetics Program, since it also seeks to improve health through an understanding of the role of heredity in health and disease. It differs from the Genetics Program, however, in seeking to enlist the aid of chemists in developing knowledge in a new phase of genetics--"manipulative genetics." Here, the important fact is that genetic material (DNA, and sometimes RNA) is a chemical, albeit a complex one. Hence, it can be manipulated or transformed, either inadvertently (for example, by pollutants in our environment) or on purpose (Genetic Engineering).

A formidable body of concepts and knowledge in this area has been built up over the last fifteen years. We now know, in principle, what genes are and how they work. We also know, in principle, how genes are altered by mutagenic chemicals in the environment, and how genes, (as for example, for the production of insulin in diabetics) could be inserted by viruses into the chromosomes of man. However, the technology and increased knowledge for the effective medical use of these concepts is not as yet available.

Most of the conceptual work has been done with bacteria and bacterial iruses. It is now being applied to human tissues and mammalian viruses. his is a very difficult undertaking.

Chemical mutagens and radiation are an everyday fact of our own environent. Fungicides, insecticides, herbicides, anti-anxiety compounds, halucingens, and many useful drugs, and even coffee are all suspected of being otential producers of harmful mutations. We do not, as yet, know how to dequately screen for the potential hazard of these substances to humans, ut methods must be developed.

3. Cellular Structure and Function. An important part of the Fundaental Science program is to gain understanding of how the cell functions n health and disease. All degenerative diseases of man, physiological rocesses such as aging, all drug actions, and toxic reactions, take place nitially at the cellular or subcellular level. Therefore, the NIGMS ponsors a large group of investigator-initiated research projects which eek understanding of cell metabolism, enzyme action, cellular structure, nd membrane function through cell biology, biophysical, and biochemical esearch programs.

4. Cell Biology. Large-scale, highly automated and monitored, ulture of specific cells which will be useful in the production of vaccines, n research on infectious diseases and in the work of diagnostic laboratories, s now under way. The development and application of new techniques have lso made possible the extensive culture and characterization of anaerobic rganisms, with the immediate application of the knowledge thus gained to he diagnosis of human health problems.

Further support will be directed to promising instrumentation studies, ell culture of various kinds, identification and characterization of naerobic microorganisms and their relations to aerobes, and to fundamental tudies at the molecular level.

5. Enzyme Structure and Function. Each chemical reaction in living rganisms is, as far as we know, mediated by an enzyme or a group of enzymes, hich control not only the occurrence of reaction but also its rate. In the bsence of enzymes required for essential body processes, metabolism will be ltered with resultant disease manifestations. Indeed, many diseases appear to have their origin in the absence of an essential enzyme or group of enzymes.

6. Biophysics. The program is designed to delineate interactions f cells and cellular components. These are responsible for normal and bnormal body function including the use of energy for activity, the ransport of material in the cell, and the coordination of cellular ctivity. Since all the reactions deal with processes which occur at oth the molecular and submolecular levels, we must be concerned with he development of sophisticated instrumentation which permits us to nvestigate reactions at this level.

In addition, the investigation and evaluation of these systems provide is with direct evidence of how cellular and subcellular structures are iltered by disease. The program in the biophysical sciences is providing he knowledge necessary for the exploration of these important mechanisms vhich in many cases is applied directly to patient care.

7. Human Adaptability. This represents a small group of investigator-initiated grants concerned with the adaptation of man and other species to adverse environments. They support research applicable to important health problems concerning the population explosion and human resourcefulness for living in the desert, the arctic, at high altitudes, and in the sea. They also relate to environmental health problems inasmuch as they may provide information on human tolerance to harmful changes in the environment.

These investigations also contribute to other programs within the Institute. For example, information on human physiological responses to cold may have a direct bearing on anesthesiology and kindred situations where procedures involving hypothermia are used. Knowledge of physiological adaptability under various circumstances can be similarly important to the treatment of traumatic injury, to studies in genetics, and to activities in biomedical engineering.

DIVISION OF RESEARCH RESOURCES, BEMT, NIH

The objectives of the Division of Research Resources in support o the broad NIH research mission are (1) to develop the fundamental sientific research capabilities of institutions so that they may become efective partners with the Federal Government in the pursuit of biomedical ojectives important to both; (2) to assist in the maintenance of the atonomy and individuality of academic institutions in the face of the ctegorical organization of Federal health agencies; and (3) to establish ad sustain, primarily in academic institutions but also in certain non-aademic research organizations, those resources essential to the advance-mnt of biomedical research and research training leading to the improve-mnt of the health of the Nation. In an effort to meet these objectives, DR has mounted four basic programs:

1. The General Research Support Program with objectives (a) to provide gneral support to both health professional and other university graduate shools and components so as to enhance the effectiveness of the research pojects underway at the institution, to redress imbalances in institutional research activities, and at the same time permit the development of institutional ojectives along self-articulated lines; (b) to offer support designed to acelerate the advancement of existing capabilities in health research and rlated graduate research training activities within institutions which hve demonstrated an appropriate base for the achievement of scientific ecellence; and (c) to assist new and emerging institutions, which have ptential but do not yet have the base nor the capability to achieve ecellence in health research and research training.

2. The General Clinical Research Centers Program with objectives a) to provide, in both effective form and adequate numbers, the facilities nd resources for continuing and expanding the capability of the Nation's linical investigators to study human disease; (b) to increase understanding f the nature and natural history of disease; (c) to extend the capability f medical science to treat and manage disease by applying at the bedside he fundamental biological knowledge acquired in basic research programs; nd (d) to train medical students and physicians in the techniques and he discipline of clinical investigation by conducting demonstrations of ew techniques and therapeutic modalities.

3. The Special Research Resources Program with objectives (a) to nhance the research capability of the Nation through application of large-cale sophisticated and efficient resources such as computer and mass pectrometry centers which can be shared by the scientific community on n institutional, regional, and/or national basis; and (b) to identify and upport other types of special research resources that can have a significant mpact on biomedical research, education, and patient care with increased mphasis on biomedical instrumentation; the production, preservation and tilization of biological materials and new emphasis in resource areas uch as radioisotope methodologies and electro-optical instrumentation.

4. The Animal Resources Program with the objective to develop and provide the resources with which the biomedical scientist and teacher can develop the knowledge for the prevention and control of disease in man by having ability to gain an understanding of basic physiological and pathological processes through experimentation on living systems. This objective is being met through the (a) Primate Research Centers Program, a specialized national resource that seeks to extend studies on primates to the diseases of man by providing sources of health primates in the United States and the proper research resource environment needed to undertake such studies; and (b) the Laboratory Animal Medicine Program that supports: (1) the upgrading of institutional animal resources; (2) the development of laboratories for the diagnosis and control of diseases of laboratory animals and (3) the development and maintenance of special strains of laboratory animals.

NATIONAL INSTITUTE OF NEUROLOGICAL DISEASES AND STROKE

ological, sensory and muscular disabilities are a leading cause of chronic human suffering conomic burden in the United States. Such conditions include cerebral palsy, mental lation, strokes, parkinsonism, epilepsy, multiple sclerosis, muscular dystrophy, and spinal , and also loss of hearing, and language. The vast majority of these problems are still able.

ch as 10 percent of the total population of the Nation may be suffering from one of approximately 200 disabling disorders. An estimated 20 percent of hospital admissions lated to these neurological and sensory ailments. Neurological ailments caused about 11.8 nt of the total United States deaths in 1965.

NINDS conducts, fosters, and supports research and research training on the causes, prevon, diagnosis, and treatment of the neurological, sensory, communicative, and muscle ders of mankind, and conducts basic research in related scientific disciplines.

lfilling these responsibilities, the Institute:

(1) Provides leadership, counsel, technical advice, and guidance in developing and maintaining a nationwide research and research training effort in the area of its program responsibilities.

(2) Provides grants-in-aid for research to public and private institutions and individuals in fields related to its areas of interest, including research project, program project, and center grants.

(3) Provides training grants and awards to increase trained professional research manpower in neurological and sensory fields.

(4) Conducts a diversified program of intramural, collaborative, epidemiological, and field research in its own laboratories, brances, and clinics.

(5) Collaborates with various agencies in collecting and disseminating material related to neurological and sensory diseases.

NATIONAL EYE INSTITUTE

In the United States today there are an estimated 411,000 legally blind and 3,500,000 who have only partial vision. About half of the totally blind are not employed, and approximately 75 percent are 40 years of age and over. The National Health Survey estimates that one million people in the United States have visual impairment so severe that they cannot read a newspaper.

Federal payments to the blind amount to more than $95 million annually. Based on limited figures from New York State and Massachusetts, it is estimated that payments for aid to the blind within the States total from $600 million to $900 million annually. It is thus quite probable that the annual bill for aid to the blind approaches $1 billion, a figure frequently used thought not authenticated.

Major causes of blindness and visual impairment include cataract, glaucoma, diabetic retinopathy, corneal scarring, uveitis, retinal detachment, tumors, amblyopia, and refractive anomalies.

The National Eye Institute was created by an Act of the 90th Congress, in 1968. Its current program was begun as part of the National Institute of Neurological Diseases and Blindness, which has been retitled as the National Institute of Neurological Diseases and Stroke.

The mission of the National Eye Institute is to

(1) conduct, foster and coordinate research on the causes, prevention, diagnosis, and treatment of blinding eye diseases and visual disorders, and including research and training in the special health problems and requirements of the blind and in the basic and clinical sciences relating to the mechanism of the visual function and preservation of sight, and

(2) administer a program of research and training grants and awards, especially against the main causes of blindness and loss of visual function and for the improvement of the condition of the visually deprived.

PART I. - NIH EXTRAMURAL RESEARCH

APPENDIX B.

PROGRAM ACCOMPLISHMENTS

National Institute of Arthritis and Metabolic Diseases

In arthritis, NIH conducted and supported studies which pioneered the introduction of corticosteroid drugs in the treatment of arthritis. Although they are not a permanent cure, these agents have resulted in vastly improved rehabilitation of patients and shortened periods of hospitalization, decreased loss of working time, and fewer doctor visits.

About one-half million Americans suffer from gout, an inherited metabolic disease which, when uncontrolled not only results in extremely disabling joint symptoms, but may eventually lead to very serious kidney complications. NIH-supported research and intramural studies in Bethesda have advanced our knowledge of gout, prevention of acute attacks and complications, and general treatment of the disease to a point where nowadays it is the most controllable of the arthritic diseases. With up-to-date rational therapy developed during the last decade primarily through NIH support and direct studies, individuals predestined to gout by heredity can lead a normal life with effective control of the disease and freedom from its crippling and serious complications.

In diabetes, the clinical research of Institute grantees led to the present-day use of the oral antidiabetic drugs--the greatest advance in the treatment of diabetes in the last ten years. These drugs have replaced unpleasant and expensive daily insulin injections in more than half of the nation's diabetics. At the present time, there are two and one-half million known diabetics.

Institute-supported research advanced the field of gastroenterology along a broad front: a new peptic ulcer drug was developed, the hormone responsible for peptic acid secretion was isolated and synthesized; mechanisms of intestinal malabsorption were discovered together with new means of counteracting it; the use of new instruments such as the flexible endoscope and intragastric camera was introduced; and new surgical procedures for gastrointestinal repair were developed.

Institute grantees have discovered or elucidated the pathologic mechanisms of a large number of serious hereditary metabolic diseases such as galactosemia, PKU (phenylketonuria) histidinemia, and many others. If untreated, most of these diseases lead to an early death preceded, in many cases, first by mental retardation and incapacitation. In this area, effective methods of diagnosis and treatment through special

diets for Wilson's disease, galactosemia and phenylketonuria were developed. Much progress has been made in understanding of cystic fibrosis; two new methods of diagnosis of this serious disease and improved maintenance therapy for its victims were also introduced.

In endocrinology, Institute grantees developed the endocrinologic knowledge and isolated and purified most of the hormones on which the use of today's oral contraceptive drugs is based. An Institute grantee in Sweden developed the treatment involving human gonadotrophic hormones which permits successful induction of ovulation and pregnancy in previously sterile women. Institute grantees have developed an effective treatment of hypopituitary dwarfism in children based on the injection of human growth hormone; the Institute organized and supported the isolation and purification of this and other important human pituitary hormones.

In kidney disease, Institute grantees developed the method of repeated long-term use of artificial kidneys to maintain the useful lives of patients who would otherwise die of chronic kidney disease. This newly developed technique also has made possible, through Institute support, the successful development of kidney transplantation for such patients which, at present, is effective in restoring a productive life to about half of the transplanted patients.

National Institute of Allergy and Infectious Diseases

The conquest of infectious disease has moved through several great eras: the sanitation of food and water that virtually eliminated the great plagues of typhoid fever, cholera, and bovine tuberculosis; the control of disease vectors that removed bubonic plague, typhus fever, malaria, yellow fever as substantial threats to a civilized nation. The development of effective immunizing agents--vaccines for smallpox, diptheria and yellow fever--spans both eras: in the past 30 years, the remarkable development of chemotherapeutic agents, both synthetic and natural--the antibiotics.

The easy problems have been "solved." Remaining are the ones made difficult because we cannot isolate the cause of disease (e.g., infectious hepatitis) or fail to prevent the spread (e.g., staphylococcus infections in hospitals, and salmonellosis) or, puzzled by failure of natural immunity to develop after disease, we do not yet know how to develop a vaccine (e.g., gonorrhea).

One of the most serious infectious disease problems in terms of disability and economic loss in modern times is the common cold. As recently as 16 years ago, influenza virus was the sole known cause of viral respiratory infection. Now, about 140 immunologically different kinds of viruses are known to be involved. Even with this knowledge, nearly 50% of upper respiratory infections remain of undetermined cause. There are many kinds of viruses--probably more than 340--capable of infecting man. (Our own intramural scientists have been responsible for discovering and characterizing over 100 of these.)

Research on virus structure, chemistry, and inheritance of characteristics has had a far-reaching influence on our knowledge of the structure and function of DNA, gene action, and cancer production by viruses. These four fields are among the 12 cited by Harvard historian Donald Fleming as part of the biological revolution of the future.

A laboratory technique that has been one key to understanding viral action is the use of specific antibody tagged with a dye that fluoresces in ultraviolet light (Fluorescent labelled antibody, or FA). NIAID funded the pioneer investigation in this field. By the FA technique, the specific and sensitive

reaction of antibody with virus (antigen) can be visualized in a special ultraviolet microscope. This permits the researcher to determine precisely where in the body the virus is located , or a laboratory technician can examine the brain of the dog that bit a child more quickly, cheaply, thoroughly, and accurately, than ever before to determine whether it contains the dreaded rabies virus.

Among the most significant advances in research are those occurring in the field of immunology. NIAID funds the bulk of immunology research. This discipline deals with the reactions of antigens (proteins, complex carbohydrates, and fat-protein combinations) that are capable of stimulating certain cells of the body to produce other complex proteins (antibodies) capable of reacting with antigens of the type that produced them. Immunology seeks to understand in terms of chemistry of the cells how the damage of disease occurs.

Far afield from infectious disease research, the antigen-antibody reaction now permits the quantitative specific determination of a number of very important hormones, such as insulin, angiotensin, and growth hormone, with consequent implications for clinical medicine, therapy, and diagnosis.

Immunobiology, the study of cellular reactions and mechanisms, is currently important in the field of tissue graft rejection but, much more importantly may be the key to the whole problem of how the body distinguishes self from non-self tissue and how it monitors continuously to detect and destroy the cancer cells that arise from genetic modification of self-tissue.

The general phenomenon of immunological tolerance (the failure of the antibody producing mechanism to respond normally to antigen) has been recognized as a possible practical solution to the problem of graft rejection of a foreign organ graft. In addition, evidence is accumulating from both animal and human virus diseases that in some cases ("slow viruses"), a tolerant condition may occur. The virus infection may then be marked, persistent, and with serious, long-term consequences.

Immunopathology, a laboratory curiosity a few years ago, is now beginning to explain a whole series of human diseases--for example, glomerulonephritis (one of the major chronic renal diseases and often a reason for kidney transplant), rheumatoid arthritis, lupus erythematosus and multiple sclerosis. Understanding of such disease will not only explain their mechanism but pinpoint the cause and permit specific drug therapy to interrupt or modify the sequence of molecular reactions.

Immunopharmacology deals with the development and use of drugs in the prevention or treatment of immunologic problems--rejection of transplanted organs, autoimmune and inflammatory diseases.

Immunosuppressive drugs are now being used clinically to treat and maintain patients with previously hopeless diseases such as lupus erythematosus, rheumatoid arthritis, psoriasis, thrombocytopenic purpura, periarteritis and certain types of granulomas. These practical uses encourage the hope that eventually drugs will be developed to block or modify a particular step in a chain that starts with antigen-antibody combination and continues through the complicated series of reactions that leads to specific tissue damage.

National Cancer Institute

The research knowledge which has not reached application in man includes the identification of animal viruses that cause cancer and the production of vaccines that prevent those cancers from developing. We hope to be able soon to identify, isolate and prepare vaccines against human cancer viruses but that remains for the future. Growing, also, is knowledge concerning chemicals that can produce cancer and the mechanisms of the carcinogenic processes.

The National Cancer Institute supports a national network of cooperative clinical groups of physicians, employing new treatment techniques for cancer patients. There are 24 Cooperative Groups, involving 250 institutions and over 1,000 physicians. These physicians provide care each year for 16,000 patients on protocol studies and in parallel treat some 138,000 additional cancer patients. Most advances in cancer chemotherapy in man come directly from studies by these groups. In addition, these cooperative groups have been responsible for training 300 physicians yearly in the principles and practice of clinical oncology with emphasis on chemotherapy.

Choriocarcinoma and other trophoblastic tumors previously--invariably fatal in less than two years--can be cured in 85-90% of cases using chemical treatment. (This is the first human cancer to be cured regularly by drugs, and the discovery was made in the clinics and laboratories of the National Cancer Institute.)

Children with acute leukemia newly diagnosed and treated intensively with combinations of drugs have a median survival of over three years compared with a three-month median survival before the beginning of the NCI's Chemotherapy Program. Other fast growing tumors as Wilm's tumor, neuroblastoma, Burkitt's lymphoma, Ewing's sarcoma can be successfully treated with combinations of drugs and/or surgery and radiation therapy leading to long survival and perhaps cure.

Hodgkin's disease can be cured by intensive radiotherapy when diagnosed while the disease is localized. If far advanced, Hodgkin's disease can be successfully treated with intensive combination drug therapy to yield long term complete remissions.

Many drugs developed as agents effective against cancer through the cooperative Cancer Chemotherapy Program described above have been found to suppress the immune response in patients receiving those drugs. Thus, the Drug Development Program of the National Cancer Institute has contributed very directly to the success of a number of organ transplant programs in many by research and development on immunosuppressive drugs.

The NCI supports 27 clinical centers for cancer research in many, wherein new diagnostic and treatment techniques are evaluated, where intensive metabolic studies of cancer patients can be undertaken and where intensive pharmacologic evaluation of proposed new anticancer agents can be carried out. The impact of these centers extends far beyond the immediate number of patients treated or physicians trained in the centers, since the research advances are communicated to all physicians caring for cancer patients.

In fiscal 1968, the NCI supported 30 projects at a cost of $1,409,000 seeking New Methods for Early Detection and Diagnosis of Cancer. Such programs range from research in cytology of the uterine cervix and alimentary mucus membranes to new radioisotope techniques for early tumor localization to mammography for detection of early breast cancer, thermography and cancer detection through biochemical and immunologic techniques. Some of these programs as "Pap smears" can be carried out in any physician's office. Others emphasizing mammography and radioisotope techniques can only be carried out in offices or hospitals with the requisite specialized equipment.

In 1960, there were only 14 physicians in the United States receiving training to become full-time radiotherapists. The NCI recognized the need in the United States in the next decade for several hundred physicians expert in radiotherapy and began an intensive radiation therapy training program, after identifying individuals and institutions best equipped to carry out the program. In 1969, over 100 American physicians are in residency or fellowship training in radiotherapy as a direct result of the emphasis, impetus and support provided by NCI for radiation therapy training programs. The resultant modification in delivery of health care is that radiation therapy is now provided by full-time specialists in the field in most metropolitan communities. For fiscal 1970, the NCI proposes expenditure of $500,000 to develop a dual purpose linear accelerator, which should result in improved efficiency and therapy for the cancer patient requiring radiation treatment.

National Heart Institute

Advances in surgical technique, coupled with the development of heart lung machines and improved life-support techniques for sustaining the patient during prolonged open-heart operations, have made possible the cure or alleviation of most forms of congenital heart disease. Moreover, the development of a variety of clinically proven "spare parts" for the heart and blood vessels has made possible the replacement of heart valves damaged by rheumatic fever; the use of artificial blood vessels to save thousands of lives and limbs threatened by arterial damage or obstructions; and artificial pacemakers to normalize heartbeat and restore health to victims of heart block and other severe heart rhythm disturbances. Circulatory assist devices currently under development promise to save many lives threatened by heart attacks and other circulatory crises.

Equally impressive have been the advances made in cardiovascular drug therapy. The development and wide clinical application of effective drugs for blood pressure control during the past decade has nearly halved the death rate from hypertension, a disease afflicting some 17-21 million Americans. Drugs for improving heart performance and for combatting abnormal fluid retention have saved and rehabilitated thousands of victims of congestive heart failure. Modern antibiotics have largely eliminated infectious heart diseases as a major health problem. Moreover, since adequate antibiotic treatment of streptococcal infections can prevent most attacks of rheumatic fever and continuous antibiotic protection can usually prevent heart-damaging recurrences, the fullest application of existing preventive techniques could largely eliminate rheumatic heart disease as a serious health problem.

Coronary heart disease and its most serious consequences, the acute heart attack, continue as our Nation's leading cause of death and disability. Nevertheless, progress is being made. New surgical techniques for improving a compromised blood supply to the heart and new drugs and related procedures for reducing the workload of the heart--hence its needs for oxygen--are rehabilitating many patients formerly incapacitated by angina pectoris. Intensive coronary care units, combining improved monitoring techniques with advanced therapeutic procedures, are saving thousands of patients who would otherwise have succumbed to rapidly developing complications of acute heart attacks. And, finally, the identification and quantitation of factors increasing heart-disease-risk--plus the development of means of reducing or eliminating many such risk factors--holds promise of preventing many first heart attacks and reducing the threat of recurrent attacks among those who have survived their first attack.

The impact of research on the cardiovascular disease problem can perhaps best be illustrated by alterations in mortality rates over the past 10 years. Overall death rates from cardiovascular diseases have declined by 5 percent; and, with the exception of arteriosclerotic heart disease, death rates have declined more than this in every major cardiovascular disease category. For example: mortality from hypertension has declined by 46% and that from rheumatic heart disease by 33%. Mortality from stroke has been reduced by 11% overall, and by 20% among those under 65. And mortality from coronary heart disease, after decades of relentless increase, appears finally to have levelled off and may be decreasing slightly.

National Institute of Dental Research

Dental Caries:
Established conclusively in laboratory animals that dental caries is an infectious, transmissible disease; showed that these features of infectivity and transmissibility are applicable to man; identified and isolated specific bacteria involved in the production of dental caries in animals and in man; developed understanding of the mechanism by which plaque deposit operates in the causation of tooth decay.

Demonstrated that a specific enzyme (dextranase) can counteract the harmful effects of dextran and related bacteria by preventing the formation of plaque.

Developed evidence in experimental animals that relates specific genetic factors to caries susceptibility.

Established conclusively that the daily human intake of 1 part per million of fluoride ion reduces the incidence of caries in permanent teeth by 60 percent; clarified the mechanism by which the fluoride ion is incorporated in the developing tooth structure and acts to enhance its resistance to caries by changing the molecular structure of the crystal components of tooth enamel; established evidence that fluoride gel, topically applied to the teeth of children can reduce dental decay by as much as 80 percent.

Periodontal Disease:
Developed evidence implicating a specific causative bacteria with characteristic morphological and cultural features; and showed that plaque formation has a comparable causative role in periodontal disease as it does in the initiation of caries.

Discovered the existence of strikingly increased amounts of a connective tissue-destroying enzyme, collagenase, in gingival tissue of patients with periodontal disease.

Established on the basis of clinical studies that poor oral hygiene and local irritation consequent to tartar (calculus) formation are the principal triggering factors in periodontal disease.

Developed presumptive evidence that fluoride in optimum concentrations reduces the incidence and severity of periodontal disease.

Cleft Palate and Lip

Developed new and improved surgical approaches to the treatment and rehabilitation of cleft palate patients.

Further clarified the interrelated roles of genetic and environmental factors in cleft palate etiology.

Demonstrated the effectiveness of the treatment and speech rehabilitation of cleft palate victims by team approach involving the coordinated efforts of a variety of health professional disciplines.

Malocclusions (Orthodontic Deformities)

Developed new, interceptive surgical approaches and simpler methods of treatment of orthodontic problems.

Additional NIDR Contributions.

Provided confirmatory evidence in laboratory animals that demonstrates the effectiveness of synthetically fabricated plastic teeth as implant replacements for lost, natural teeth.

Contributed significantly to the improvement and refinement of methods of general anesthesia for ambulatory dental patients by identifying, for the first time, the full range of physiological responses to a variety of general anesthetic agents.

Increased the effectiveness and safety of utilization of the high speed drill in dentistry.

Demonstrated the effectiveness of topical steroids to reduce pain in sensitive teeth.

National Institute of Neurological Diseases and Stroke

Parkinsonism: in Institute-supported experimental treatment, 75 percent of patients benefitted from the drug L-DOPA; surgical treatment also is effective for some forms of parkinsonism.

Birth Defects: new knowledge of the damaging effect of fetal asphyxia has made possible the prevention of neurological damage to newborns; rubella and toxoplasmosis are now known to be severely damaging influences during pregnancy; evidence indicates that malnutrition in a pregnant woman may endanger the mental development of her child.

Slow Viruses: strong evidence implicates viruses in certain neurological disorders; two degenerative neurological disorders, kuru and Jakob-Creutzfeldt disease, have been transmitted from man to chimpanzee and on to other animals; subacute sclerosing panencephalitis, a fatal brain disease of children, found to be caused by a measles virus which may reside in the body for many years after the acute infection.

Neuromuscular Disorders: screening tests now can detect 65 percent of carriers of progressive muscular dystrophy; three new forms of muscular dystrophy have been identified and thymectomy has been found to be an effective treatment for young women with myasthenia gravis.

Brain Tumors: development of the brain scanner, now widely used to detect brain tumors, has saved many lives; treatment for inoperable brain tumors is more effective with use of an implanted reservoir in the brain, allowing drugs to bathe the tumor area.

Epilepsy: improved surgical techniques have eliminated temporal lobe seizures for many patients; new anticonvulsant drugs have been developed and evaluated with Institute support leading to the effective control of epilepsy in most patients.

Deafness: Surgical treatment restores hearing to 90 percent of middle ear otosclerosis victims, otosclerosis of the inner ear can be successfully treated medically with sodium fluoride; a new diagnostic tool, evoked response audiometry provides a true picture of the brain's response to sound and makes diagnosis possible in tiny babies and brain damaged children; other new testing devices provide accurate and early diagnosis making treatment possible.

National Eye Institute

Retrolental Fibroplasia (RLF): identification of excessive oxygen levels as the cause of RLF in prematures almost eliminated the problem a decade ago; following recent use of oxygen for respiratory distress in prematures, progress has been made in establishing guidelines to safe levels by monitoring arterial oxygen to prevent eye damage.

Glaucoma: early identification and effective treatment methods for glaucoma have been developed including a new steroid provocative test and synthetic steroid treatment; a new drug is useful in acute primary and secondary glaucoma and as a preoperative medication for eye surgery;primary, open-angle glaucoma, the most common form of the disorder, has been found to be inherited as a recessive trait.

Cataracts: use of the enzyme, alpha chymotrypsin, and a new cryosurgery technique facilitate surgical removal of cataracts.

Infections: discovery of IDU (iodo-deoxyuridine) provides a 90 percent effective treatment within one week for a potentially blinding infection of the eye; tear glands have been found to be the site of the dormant herpes virus.

Corneal Transplants: great strides have been made in perfecting corneal transplant surgery, new testing methods indicate the vitality of donor material, and special freezing techniques preserve the cornea until needed. Endothelial dystrophy, considered hopeless ten years ago, responds to grafts in 70 percent of cases. A recent single, quick procedure bonds a plastic lens to the corneal surface after removal of the epithelium, improving sight in certain diseases of the cornea and protecting the cornea from further degeneration.

Uveitis: toxoplasmosis has been identified as a major cause of uveitis; 43 percent of cases of uveitis caused by toxoplasmosis respond to treatment with pyrimethamine.

Tumors: fluorescent dyes and radioactive tracers aid in diagnosing and detecting tumor of the eye.

Techniques: photocoagulation has been introduced to this country by Institute grantees as a treatment for retinal detachments and glaucoma; also use of lasers for retinal detachments and other eye disorders was pioneered by grantees.

National Institute of General Medical Sciences

Pharmacology: Pharmacological research in children reveals that many children remain toxic for long periods after birth as a result of drugs taken by the mother which are carried across the placenta. Barbiturates, aspirin, and narcotics are frequent offenders. The study has so far involved hundreds of children and influenced clinical treatment of many others. The Pharmacology-Toxicology Program of NIGMS has supported operation of a large adverse drug reaction reporting system in six major Boston hospitals with the idea of developing a nationwide system. Investigations in the interactive effects of common drugs have shown that: (a) Phenobarbital has the power of inducing enzyme formation and thereby increasing the rate of metabolism in drugs; (b) patients taking antidepressants and antihypertensive agents at the same time, as thousands do, may suffer great impairment of activity of one of both drugs.

Trauma Research: Research in trauma is saving hundreds of lives following accidental injury in this country. New techniques of fluid replacement developed by an NIGMS grantee have had widespread benefits in Vietnam as well as in civilian practice. Fluid exchange and water loss determinations in the traumatized patient have been reevaluated and refined. Another investigator has synthesized and tested a new antibacterial agent for protection of burns which is finding wide use in flash burns in the war zones.

Anesthesiology: Developments in the anesthesiology centers established by NIGMS are widely disseminated and are used in administration of the millions of anesthetics given each year in this country. The development of a deliberate hypotension rather than attempting to maintain blood pressure during surgery has proven results in better control of bleeding. Patients have been shown to have dangerous reactions with anesthetics when other commonly-used drugs have been previously administered and this is now recognized in pretreatment of the surgical patient. Development of monitoring devices and systems for measuring blood gas levels in the anesthetized patient has developed into a new approach to the management of critically ill patients which have proven to be of nationwide benefit to thousands of patients. Grantees developed new approaches in obstetrical anesthesia providing new understanding of anesthetic effects on the newborn and the resuscitation of infants. These techniques have directly reduced neonatal mortality throughout the country.

Automated Clinical Laboratories: A low cost computer--analytical system of automation of chemical analyses in the hospital laboratory has been developed and is in operation. The system plans are now being distributed for general hospital use. This development will lead to great saving in the patient cost of the numerous analytic tests required by modern medical methods. A completely new method of analysis of body fluids has been developed Accurate rapid analysis using high pressure gas chromatography and ultracentrifugation has already been made available to industry and is being produced for the commercial market.

Genetics: Techniques have been developed for the detection and identification of genetic diseases. This leads to improved genetic counseling to parents and earlier and improved specific treatment for their offspring. Geneticists have developed a simple test to detect the genetic abnormality which prevents the destruction of the curare-like drug succinylcholine. Such individuals may die when given the drug. Since the genetic defect occurs in 1:3000 cases and almost every surgical patient is given some form of muscle relaxant, the lives of thousands of patients per year are protected.

National Institute of Child Health and Human Development

A major concern is the stimulation of fundamental research related to maternal and infant health and to the reducation of infant mortality.

Between 1963 and 1968, the infant mortality rate in this country dropped from 25.2 to 21.7 per 1,000 live births. New knowledge on the management of pregnancy and care of the newborn has contributed to infant survival. The prevention of erythrobastosis fetalis caused by Rh blood group incompatibility can save the lives of as many as 5,000 infants each year. A major incompatibility between mother and infant involving the Rh blood factor can result in the death of the fetus or newborn because of excessive destruction of the infant's red blood cells shortly before or after birth. Research supported by the NICHD has resulted in an anti-Rh preparation, a highly concentrated solution containing immunoglobulins with Rh antibodies. This preparation is given within a few days after an Rh-negative mother has given birth to an unaffected Rh-positive baby. This afford protection for infants born subsequently.

An increasing number of phenylketonuric (PKU) women with normal intelligence or mild mental retardation are approaching child bearing age. Over 50 non-PKU children born to women with untreated PKU have been found to be mentally subnormal. Many had developments or intelligence quotient scores lower than those of their mothers. Animal studies suggest that high levels of phenylalanine in the maternal blood cause damage to the fetus. The findings are supportive of routine prenatal testing for maternal PKU as a public health measure.

NICHD is supporting studies of language development, maturation, preschool intervention, and community influence pertinent to the education performance of culturally deprived children. Results to date indicate that systematic social reinforcement through praise results in more rapid learning on the part of the children.

NICHD has also emphasized studies relating to population control and aging. A recent study of United States mortality trends since 1951 indicates that the incidence of thromboembolic disease in women is increased for those who have used oral contraceptives. This research confirms the results of case-controlled studies in Great Britain, where the risk of death from pulmonary embolism or cerebral thrombosis was estimated to be seven to eight times higher in such women.

A National Fertility Study supported by the NICHD revealed that for all couples in the United States who intended to have no more children, less than one-quarter had been completely successful in controlling their fertility by using contraceptives. This study indicates the importance of developing an array of contraceptive methods to meet the needs of all population groups.

Judged by standards established in young persons, half the persons over 50 years of age have diabetic type of glucose tolerance curve. This age-related reduction in carbohydrate tolerance may prove to be important in the production of diabetes mellitus and atherosclerosis, both of which are very common in middle-aged and elderly persons. Studies have shown that this reduction in carbohydrate tolerance is due to decreased production of insulin by older persons in response to carbohydrate intake.

PART I. - NIH EXTRAMURAL RESEARCH

APPENDIX C: PART I

SUMMARIES OF PAST STUDIES

REPORT OF THE SURGEON GENERAL'S CONSULTANT GROUP
ON MEDICAL EDUCATION
(BANE REPORT)
1959

Recommendations

__port of Students__

. Federal Government should establish educational grants-in-aid for medical students on the basis of merit and need.

. Office of Education, in administering its program of student loans under NDEA, should give special consideration to needs of institutions having medical schools.

__h Medical School__

(Various general recommendations to assure maintaining quality while permitting innovation in medical education.)

__nancing Medical Education__

1. More generous public and private support for basic operations of medical schools.

2. Full indirect costs under research grants.

3. Institutional grants.

4. Matching grants for medical school construction.

__Planning__

1. When Federal funds become available to aid medical education, a national committee should be established to advise the Surgeon General on the administration of such funds. The work of the group should be closely coordinated with that of the National Advisory Council on Health Research Facilities and the Federal Hospital Council.

2. The Surgeon General should establish a consultant group or groups to study the educational needs in the health professions related to medicine.

170

REPORT OF THE COMMITTEE OF CONSULTANTS ON MEDICAL RESEARCH
("BO" JONES REPORT, 1960)

Recommendations

While the funds appropriated by Congress for the support of medical research have been substantial, they are not sufficient. Funds should be allocated to support medical research on the scale required to carry out a determined attack on major health problems.

New administrative patterns for the support of research should be employed, including Congressional consideration of two-year (or more) funding of programs.

The Federal Government should:

a. appropriate funds on a matching basis for the construction of health educational facilities;

b. authorize NIH to allow for the costs of research directly related to the program supported either on a full-cost basis or on the basis of 25% of total direct costs;

c. be granted authority by law for institutional grants to health educational facilities for the general support of their medical research and research training programs, with the proposed limit on such grants to 15% of the total research grant appropriation eliminated.

Scholarships, fellowships, and loan assistance should be provided to medical and dental students as it now is provided to Ph.D. candidates in the basic sciences.

The Division of General Medical Sciences should be raised to Institute status by legislation, and a special administrative unit should be established to administer international activities of the NIH.

Additional study sections should be established, and some of the present study sections should be subdivided when necessary to distribute the burdens of project review.

Clinical research centers, both categorical and noncategorical, and special research centers should be developed, to be concerned with a specific disease, approach, or resource need.

Responsibility for allocating research and training funds should be returned to the research institutions in the form of institutional grants.

A medical student research training program based on the principles of the experimental training grants should be established and the various training programs should be consolidated as much as practicable.

The authorization for the Health Research Facilities Construction Act should be extended for a minimum of five years beyond its present expiration date, and the proposed amendment thereof, which authorizes a 10-year program of grants for construction of health educational facilities, should be adopted.

In addition to the recommended appropriations for fiscal year 1961, seven areas should receive special emphasis in fiscal year 1961 and should be funded in the amount of $87,500,000:

(1) General and Categorical Clinical Research Centers
(2) Primate Centers
(3) Support of Medical Libraries
(4) Communications Research and Translation
(5) Instrumentation Research
(6) Additional Opportunities for Stable Academic Careers
(7) International Medical Research.

FEDERAL SUPPORT OF BASIC RESEARCH
IN INSTITUTIONS OF HIGHER LEARNING
(NATIONAL ACADEMY OF SCIENCES)
(KISTIAKOWSKY REPORT, 1964)

Recommendations

1. Research project grants and contracts should remain the backbone of Federal policy in support of basic research in science in universities.

2. The selection of projects on the basis of the scientific quality of the work proposed, determined by the judgment of scientists well versed in the areas concerned, should be retained as a prime basis for Federal support.

3. In addition to the project grant-contract system of research support, three auxiliary types of support should be utilized:

   a. institutional or general research grants,

   b. a system of small research grants,

   c. a distinct and selective program of research grants to be made available to some weaker institutions on the basis of demonstrated will to utilize new funds to raise the level of research and graduate education.

4. Federal agencies should pay for indirect costs, on grants as well as contracts, at a rate substantially equivalent to audited costs.

REPORT TO THE PRESIDENT
ON BIOMEDICAL SCIENCE AND ITS ADMINISTRATION
(WOOLDRIDGE REPORT)
1965

Recommendations

Organization and Procedure

1 Endorsed current NIH programs.

2 Problems of program balance should be given increased emphasis.

3 New advisory group ("Policy and Planning Council") to assist the Office of the Director, NIH, in making major plans and policies.

4 Policy and Planning Council should be encouraged by Congressional Committees to participate in annual budgetary hearings and in formulation of NIH programs.

5 Tightening of lines of authority within NIH. (Advisory Councils and Institute Directors should owe their appointments and their authority to no higher Government level than that of Director of NIH.)

6 Discretionary authority for NIH for the transfer of funds from one category to another.

. Easier access to and greater participation for the Director, NIH, in councils of higher authority in DHEW.

. Strong and analytical NIH planning staff.

. Strengthened staff and long-range planning activities for NIH.

xtramural Programs

. Endorsed study section procedure utilizing scientific peer judgments as the best available method for awarding research grants.

. Increased participation of physical scientists and mathematicians in all aspects of NIH operations.

. Strengthened authority and increased responsibility of grantee institution for the work performed by staff members, when the quality of institutional management merits it.

. Encouragement of development of institutions' administrative capacities to accept responsibility for its own grantees.

ct Operations and Intramural Programs

Policy and Planning Council should review NIH intramural research.

Collaborative programs should be an important continuing function of NIH.

Collaborative projects with the highest probability of payoff should be activated and provision made for their sound management. Steps to provide this assurance include:

a. Continued use by Institutes of advice of outside experts.

b. Exercise by the Policy and Planning Council of a high-level advisory responsibility for all major collaborative programs.

c. Rule that no large collaborative program will be started without the assurance of availability of a strong management team.

d. More dependence on appraisal and advice of outside consultants.

REPORT OF THE SECRETARY'S ADVISORY COMMITTEE
ON THE MANAGEMENT OF NIH RESEARCH CONTRACTS AND GRANTS
(RUINA REPORT)

1960

<u>Recommendations</u>

1. Endorsed present system of NIH project grants.

2. The means by which NIH develops administrative mechanisms, advisory channels, and an adequate staff of individuals who can assume technical managerial responsibility should be accorded top priority in planning

3. The Committee is unanimous in the opinion that the NIH project grant apparatus is wholly inappropriate for programs of directed research and development.

4. HEW should give consideration to the means of informing biomedical scientists concerning the differences in the objectives of undirected research under the project grant system and directed research or development under a contract system, and the growing importance of the latter.

5. Study should be given to the establishment of a separate institution within NIH designed to manage programs of biomedical development.

6. Each advisory council should concentrate its efforts on reviewing major overall issues confronting its Institute.

REPORT OF THE COMMISSION ON RESEARCH
(AMA, 1967)

Recommendations

1. The progress of the NIH should be recognized for their contributions to the national biomedical research effort.

2. The AMA should support special development funds for selected schools of good potential.

3. Membership on NIH study sections and advisory councils should provide for sufficient rotation, with the main consideration being professional attainment and eminence of the members.

4. An advisory group to assist in program planning should be established under statutory authority, in an advisory relationship to the Director, NIH, but with independent status.

5. The AMA should support legislation providing for Federal payment of all institutional costs of research projects authorized and funded by the Federal Government.

6. Increased use of the institutional grant and the program grant should be supported as a means for shifting more decision-making responsibility for biomedical research from the NIH to participating research institutions.

RECOMMENDATIONS OF THE 1966 ROGERS SUBCOMMITTEE REPORT
ON ITS INVESTIGATION OF NIH

ecommendation A: "The NIH should strengthen its capacity for long-range planning" (for determining optimum utilization of its funds).

1. The NIH should make maximum utilization as soon as possible of the Policy and Planning Council recommended by the Wooldridge Committee.

2. The NIH should "establish a planning process...which permits continuing scanning of all biomedical research to identify areas which merit greater support or which have reached a stage where more focused effort might have significant health payoff."

ecommendation B: "The NIH should institute necessary reforms to tighten its administrative procedures for program implementation."

1. With respect to the Research Career Program, the Subcommittee recommends:

   a. The NIH review the policies governing the Research Career Program to clarify the responsibilities of the institutions and awardees relating to outside activities and income and reporting thereon, allowable salaries, and dispositions of fees remitted by awardees.

   b. The NIH establish firm criteria relating to the eligibility of candidates for awards under the program.

2. With respect to research grant cost analysis, the Subcommittee recommends that the NIH install procedures whereby:

   a. The financial requirements of research project grants would be indicated on the application in sufficient detail to permit a determination as to necessity and reasonableness.

   b. The necessity for personnel, equipment, supplies, and so forth, be specifically reviewed and approved by the Study Sections.

   c. The reasonableness of the costs budgeted and actual expenditures be subject to review and approval by qualified cost analysts.

3. With respect to strengthening the administration of foreign grants, the Committee recommends:

   a. Criteria for awarding of grants should be made more definitive in order to permit meaningful application and uniform interpretation.

   b. Members of Study Sections and National Advisory Councils should be better advised as to these criteria.

   c. The basis of satisfaction of these criteria should be indicated on summary statements for the National Advisory Councils.

   d. Measures should be instituted to assure that Study Sections and National Advisory Councils adhere to criteria.

ther Report findings or conclusions--some with the force of recommendations:

1. Concerning adequacy of "dual review" systems for extramural programs:

   a. Consideration should be given to revising the system for review and approval of grant applications in order to better cope with the present large volume and high degree of complexity of the application.

   b. The number of Study Sections and other advisory groups should be increased.

   c. It is unrealistic to assume that the combined knowledge of the members of Study Sections and Councils will include all of the latest information available in their particular specialty.

2. Concerning the nature and scope of the NIH intramural research program:

   a. The Government should not undertake a program that can readily be performed by nongovernment establishments.

   b. The NIH should devise a system to coordinate intramural and extramural programs whereby pre-established overall goals could be pursued by complementary projects. Advisory Councils should be given responsibility for intramural programs as well as extramural programs.

PART I. - NIH EXTRAMURAL RESEARCH

APPENDIX C: PART I

DISCIPLINE ORIENTED STUDIES

The National Institute of General Medical Sciences (NIGMS)

a. A report on bioengineering entitled "Future Goals of Bioengineering" was published recently by Academic Press. There was also a National Academy of Sciences report on bioengineering. Other reports from committees and conferences may be published in professional journals.

b. The Institute schedules a series of conferences, about six or seven per year, utilizing up to 20 consultants each, to evaluate the research status, trends and needs in various fields. Pharmacology and chemical mutagenesis have been the subjects of recent conferences. In addition, through the program training committees, there are about 20 reports per year assessing the status of various scientific fields. The Institute also maintains three or four consultants at a time, usually university department chairmen, to provide information about technological developments related to various programs, such as anesthesiology. Standing committees occasionally review contracts or grants, or provide evaluation.

c. The Institute has two contracts with the National Academy of Sciences, one of which provides support for activities of the Drug Research Board. A contract was awarded recently to the Federation of American Societies for Experimental Biology, and there is one to the American Society of Pharmacology and Therapeutics.

The National Institute of Neurological Diseases and Stroke (NINDS)

a. Greenbrier Conference on the Neurological Sciences, sponsored by the American Neurological Association and NINDS, was held in November 1966. A report of a Council Committee involved with Vision and Its Disorders has been published. Also, a report of a Council Task Force for Human Communication and Its Disorders is in draft form.

b. Recent and planned evaluation activities include the following. (1) An NINDS Workshop on Neurological Training was held in January 1969. (2) There was a symposium on the Epilepsies at the Broadmoor Hotel in Colorado Springs in January 1969. (3) A Workshop on Training and the Communicative Sciences, held on April 16-17, 1969, probably will yield a publication. (4) NINDS has an active Council Subcommittee on Head Injury and in April 1969 they reported on Recent Findings in Head Injury. (5) A research conference on Spinal Cord and Neck Injury is scheduled for May 15-17, 1969. (6) A Joint Council Subcommittee on Cerebrovascular Disease prepares a report every three years.

c. None reported.

The National Institute of Arthritis and Metabolic Diseases (NIAMD)

a. Specific conferences are organized on scientific topics of importance. To help facilitate greater integration of research and clinical efforts an Index of ongoing programs such as Endocrinology, is published bimonthly.

b. During the past two and one-half years, the Institute has convened panels of ad hoc consultants for review of the state-of-the-art and to examine the effectiveness of the Institute's programs. They have been valuable in establishing a consensus concerning directions of desirable future research efforts through their evaluations of arthritis, dermatology, diabetes, inherited metabolic diseases, gastroenterology, hematology, nutrition, urology and kidney disease.

c. There was Institute staff participation in the 1968 Report on the National Program for Dermatology, prepared by the Joint Committee on Planning for Dermatology, established by the American Academy of Dermatology, Inc. There will be a final report in addition to this preliminary one. The purpose is "to assist the government in its evaluation of the achievement, direction, and needs of the specialty of dermatology so that it may serve as a guide for future planning and support as an aid to the implementation of the goals and overall health programs of the government." Institute staff also participated in the preparation of a Preliminary Report - A National Health Program for Orthopaedics, January 1969. There are similar plans for other Institute program areas.

The National Institute of Environmental Health Sciences (NIEHS)

a. None are reported at present, but there will be a series of background documents and reports resulting from the findings of a Task Force (See b). A final report will synthesize the findings and recommendations.

b. The Institute is sponsoring a Task Force on Research Planning in Environmental Health Science, to be convened in Corvallis, Oregon in June 1969. There will be subtask forces on Air Pollution, Food and Water Toxicology, Physical Factors in the Environment, and Community and Industrial Exposures, and there will be interacting subcommittees. The Task Force will provide a base line of identified problems, goals, objectives and priorities against which future progress can be evaluated.

c. None reported.

The National Institute of Allergy and Infectious Diseases (NIAID)

a. The proceedings of a symposium co-sponsored by this Institute on Immunological Tolerance were published by Academic Press and a resume was published in Science, March 1969.

b. The Institute co-sponsored an international symposium on one of the leading problems of immunologic research - namely, Immunological Tolerance, in September 1968 at Augusta, Michigan. A contract was awarded to a Master's degree level scientist to evaluate the state-of-the-art in the field of drug resistance.

c. None reported.

The National Institute of Child Health and Human Development (NICHD)

a. From 1967 to the present time, evaluation activities have resulted in the publication of 20 books, with two others in press. Of the 22, 13 are behaviorally oriented. Examples are: (1) Sudden Death in Infants; (2) Optimal Health Care for Mothers and Children: A National Priority; (3) The Social Sciences and Mental Retardation: Family Components; and (4) Perspectives on Human Deprivation: Biological, Psychological, and Sociological.

b. Sixteen workshops or conferences related to Institute programs have been conducted or are scheduled for the future. Examples of these are: (1) Principles of Design of a Research Center with Particular Reference to the Intensive Care of High-Risk Newborn Infants; (2) Low Birth Weight--Basic Considerations in Fetal Growth and Parturition; (3) Low Birth Weight--Factors Influencing Survival, Progress and Functional Integrity; (4) Nutrition, Growth, and Development of the American Indian Child; (5) Neurobiological Methods for Assessment of Impaired Brain Function in the Malnourished Child; (6) Key Issues in Infant Mortality; and (7) Environmental Influences on Genetic Expression.

c. A list of non-agency evaluation of programs, by organization and title of the effort, includes the following. (1) National Academy of Sciences: Survey Committee on the Behavioral and Social Sciences. (2) President's Committee on Population and Family Planning: The Transition from Concern to Action. (3) Population Council (N.Y.C.): Survey of Manpower and Training Requirements. (4) American Association on Mental Deficiency: Appraisal and Revision of the AAMD Classification. (5) Western Interstate Commission for Higher Education: Regional Cooperation in Mental Retardation. (6) Society for Research in Child Development: Prepare a Manuscript on Advances in Child Development: (7) Gerontology and Geriatrics. (8) American Institute for Research: Development and Systemization of Theories Relating to Retirement. (9) Family and Child Services of Washington, D. C.: Analysis of Data on the Personality Development of Adopted Children During Middle Childhood.

The Division of Research Grants (DRG)

a. The reports of the various meetings described in (b) are published in scientific journals, or are forwarded to the appropriate funding units of the NIH for use in their program planning. Also, scientific reports (in Physical and Molecular Biology; Immunology; and Nutrition and Developmental Biology) resulted from a series of scientific evaluation conferences sponsored by the Office for Research Analysis and Evaluation in October 1968. These are available to NIH administrators, to other government agencies and to members of the scientific community.

b. Through the initial review groups in the Research Grants Review Branch, composed of leading scientists in the research community, workshops, symposia, and conferences have been and continue to be organized to evaluate the needs of biomedical research related to the programs of the NIH. Besides being of value to the funding units of NIH, the reports of these meetings are of great interest and value to the scientific community since they review areas of research and indicate those which have been neglected or are of high priority because of recent advances. Some recent meetings organized by RGRB initial review groups are: (1) Computer Applications in Genetics; (2) The Development of Animal Model Systems for the Study of the Etiology of Emphysema and Other Chronic Obstructive Respiratory Diseases; (3) The Value of Computers in Epidemiology Research. Examples of seminars being planned are: (1) Assessment and Alleviation of Malnutrition in the U.S.; (2) Ovulation, Its Physiology and Anticipation; (3) Comparative Gastroenterology.

In addition to the above activities, the RGRB is also continuing to evaluate the initial review process in order to recommend policies or procedures which can provide new approaches to the technical review of applications and improve the efficiency.

c. Through a task order of an NIH contract to the National Academy of Sciences, DRG supports the activities of a variety of committees in areas such as anesthesia, pathology, plasma and plasma substitutes, trauma and tissue transplantation. Meetings of these groups are devoted to evaluation of current research and research needs in a variety of aspects of the fields.

The Office for Research Analysis and Evaluation has provided contract support for work related to scientific field evaluation.

The National Heart Institute (NHI)

a. On a continuing basis a senior member of the Institute staff with medical background prepares comprehensive reviews of NHI grants supporting research in discrete areas of importance. Each review is carefully documented, published, and distributed widely; each review requires 12 to 18 months of preparation. Recent reviews include "Rheumatic Heart Disease," "Congenital Heart Disease," and "The Hereditary Bases of Cardiovascular Diseases." Just completed is the review of NHI grants concerned with the "Respiratory Tract in Health and Disease." The review currently being prepared is entitled "The Immunologic Basis of Cardiovascular Diseases." The summary papers resulting from the Second National Conference on Cardiovascular Diseases were published in a booklet entitled "The Heart and Circulation," 1964.

b. The Institute utilizes a variety of techniques and methods to evaluate program effectiveness. These may involve individuals, committees, or agencies; they may involve in-house talent or consultant experts. A number of program evaluations are underway currently including:

(1) cardiopulmonary diseases; (2) diet and heart disease; (3) atherosclerosis; (4) chronic cardiac diseases and cardiac replacement; (5) cerebrovascular disease by the NHI-NINDS Joint Council Subcommittee; (6) drugs and coronary heart disease; (7) epidemiologic and biometric research; and (8) cooperative studies.

c. The Institute has utilized the services of individual, non-agency, expert consultants to assess program effectiveness, e.g., in the analysis of the hematologic research program.

The National Institute of Dental Research (NIDR)

a. A publication, entitled "Cleft Lip and Cleft Palate" (which appeared in Science in 1967) resulted from evaluation studies of teratogens. Other reports from meetings such as a Symposium on Bone Growth - as revealed by in vivo markings, a Conference on Craniofacial Growth, and a workshop on Graduate Education are being prepared for publication. A report on a Training Workshop, held in Atlantic City in 1969 by an ad hoc committee, will be published.

b. A dental caries task force has been established to evaluate advances in caries research and to coordinate the caries research program supported by NIDR's intramural, extramural and contract operations. An evaluation of clinical research on an ad hoc committee basis is in progress and will be continued annually. A workshop for evaluation of research on phosphate, held in Houston, Texas in 1969, resulted in plans to expand and continue such studies.

c. A contract to carry out the state-of-the-art study of research concerned with speech pathology related to cleft palate is under consideration.

The National Cancer Institute (NCI)

a. Analysis and evaluation reports, published as administrative documents or individual bulletins, have been published or are in press. Examples are: (1) A report on the "Cooperative Studies Workshop," conducted by the Cancer Clinical Investigation Review Committee in October 1968. (2) The Richardson Committee reviewed and reported on the progress and accomplishments of the Collaborative Research program. (3) There was a report to the Council from the Discussion Group on Chemical Carcinogenesis.

b. Some Institute evaluation activities are the following. (1) For certain programs, there is continuous evaluation rather than periodic reviews. This includes review of the Sloan-Kettering Institute program by a Special Programs Advisory Committee. Evaluations and recommendations are provided to the Director, NCI, and to the Council. (2) There are two standing committees to provide continuing evaluation of the Clinical Cancer Training Program, one each in the dental and medical areas. (3) The Committee on Radiation Therapy Studies has

evaluated the Institute's training and research programs and presently they are reviewing the ways in which radiation therapy can relate to the Regional Medical programs. (4) There is staff study of the effectiveness of all training programs of the Institute, with recommendations to the Director.

c. None

PART II

NATIONAL INSTITUTE OF MENTAL HEALTH

CONTRIBUTION TO REPORT OF INCREASING KNOWLEDGE TEAM

OF DHEW HEALTH TASK FORCE

PART II.

SUMMARY OF NATIONAL INSTITUTE OF MENTAL HEALTH
REPORT TO INCREASING KNOWLEDGE TEAM OF DHEW HEALTH TASK FORCE

ogram Goals. The ultimate goal of the mental health research program is to revent, control and ameliorate mental disorders. More than 400,000 patients rrently reside in mental hospitals, victims of the major mental disorders. In der to reach this goal the Institute supports studies in a variety of fields to ovide the scientific groundwork for sound approaches toward the prevention, agnosis and treatment of mental illness and the promotion of mental health.

jectives. Scientists throughout the United States, and some abroad, supported NIMH grants, utilize a wide range of approaches to investigations of human havior, including clinical, epidemiological psychopharmacological and applied search. Support is provided for a broad spectrum of studies, including research genetics, biochemistry, neurophysiology, psychiatry, psychology, sociology, thropology and related disciplines.

proximation of objectives to need. Many of these studies focus on specific ychopathological phenomena. Clinical research is conducted on the causes, agnosis, prognosis and treatment of the mental disorders. Psychopharmacological search is conducted on the ways in which drugs influence thought, mood and havior and to evaluate and improve the use of drugs in the treatment of mental llness. Applied research is directed at improving the quality of mental health rvices delivered to the public. Basic behavioral research, to obtain normative ata on physiological, psychological, and social growth, is also an integral part f the Institute's program. The results of such research provide the baselines rom which deviations in human development can be measured and understood, and the nsights by which many of the origins of mental illness can be identified.

unding Requirements. Our goals are massive and global in nature--the prevention, ontrol and amelioration of mental disorders--the steps toward these goals are slow, rogress occurring as additional knowledge accrues on the many specific and general esearch questions under attack.

hus, it would be most unrealistic to attempt to outline a timetable of research utputs, discoveries, breakthroughs, etc. to be expected over each of the years etween FY 1971 and 1975. However, support at the realistic level indicated below ould enable us to continue our progress toward a fuller understanding of normal nd abnormal human behavior.

Y 1971 - 1975 Estimates (Realistic)	1971	1972	1973	1974	1975
ll - Research Grants, Contracts, irect Operations and General esearch Support	60,065	70,599	82,477	100,970	118,588

Y 1971 - 1975 Estimates Necessary to eet Minimum Program Needs	1971	1972	1973	1974	1975
ll - Research Grants, Contracts, irect Operations and General esearch Support	54,461	58,273	64,886	69,624	74,745

upport at the minimum level would curtail research efforts and reduce the pace of pplication of new knowledge, resulting in prolongation of suffering by the housands of patients afflicted with mental diseases.

April 23, 1969
NIMH

PROGRAM REPORT AND PLAN

r gram Background

. Program Objectives

1. The program objectives are the prevention, control and amelioration of mental disorders and the promotion of mental health. More than 400,000 patients currently reside in mental hospitals, victims of the major mental disorders.

2. Legislation language will appear in overall NIH program report and plan.

3. Research activity is, of course, not easily amenable to a direct evaluation of accomplishments, nor is it possible to construct a timetable of expectations with regard to scientific endeavor. Progress in mental health research, as in any difficult scientific enterprise, is often slow or uneven; frequently an important finding can be made and meaningfully applied only after years spent in the accumulation of varied bits of research evidence. Instances can be found in the Institute's progress during the past decade on a variety of fronts. Through its growing programs of research activities, the Institute has, for example, advanced the drug treatment of mental illness; the diagnosis and prevention of phenylketonuria, a form of mental retardation; the prevention of suicide; and the unfolding of at least a few of the mysteries of man's repertoire of behavior--in studies showing, for example, how brain chemistry influences our emotions, or how early experiences shape later behavior, and how the brain itself can be measurably modified by use.

Schizophrenia continues to be the mental problem of surpassing concern. Fully one-half of the nearly half-million mental hospital beds in the Nation are occupied by patients diagnosed as schizophrenic. Moreover, the disease strikes most frequently during the most productive years of life; three-fourths of all first-admission schizophrenics are between 15 and 44 years old.

In the study of the major mental illnesses many investigators continue to probe the biological bases of schizophrenia, while others concentrate on the question of relative contribution of psychological, social, and cultural factors in the genesis of the disease.

Research in the biomedical sphere of schizophrenia has centered around two viable possibilities: That some forms of the disease may be associated with an abnormality in the biological process of transmethylation, and that an abnormal protein occurring in the blood of some schizophrenics may be implicated in the etiology of the disorder.

Recent developments in instrumentation have made possible a renewed exploration of the electrical activity of the brain in schizophrenic patients. Such techniques may be capable of demonstrating significant differences in brain functions among psychotics, neurotics, and normals.

Studies that are expected to cast more light on the relative effects of environment and heredity and the incidence and course of schizophrenia have been developed by Institute researchers to be carried out at home and abroad. A Danish study has as its goal a determination of the incidence of schizophrenia in both biological and adoptive families of both schizophrenic and normal subjects. An Israeli study seeks to compare children of schizophrenic parents raised in the kibbutz with those raised by their own families.

Evidence is being accumulated in a number of Institute studies of the critical role that learned communication patterns play in schizophrenia. The results of one study have led the investigators to conclude that the parents' manner of communication may provide a conceptual environment constituting a virtual training course in irrational thought processes for their children.

Other studies attest to the efficacy of the phenothiazine derivatives either in enabling patients to be maintained in the community without hospitalization or in producing rapid improvement in patients who have been hospitalized for their schizophrenic illness.

The Institute is also directing much of its attention to the problem of depression. Approximately 90,000 persons are hospitalized for depressive reactions each year. In addition, much depression is masked by and contributes to the bodily ills and complaints of a large proportion of patients who receive medical care. Depression may lead not only to prolonged disability but also to suicide.

The Institute's research in the area of etiological and descriptive studies of depression has embraced biological studies as well as explorations of the role of psychological, social, and culture factors in the disease.

While major success has attended the use of drug therapy with schizophrenic patients, drug treatment of depression has not been as generally successful. Two major classes of drugs, the monoamine oxidase inhibitors and the imipramine-like drugs, have been the most widely studied. Grant-supported control studies have provided results which reflect the general confusion in the clinical literature regarding these agents.

In summary, the available drugs for the treatment of depression show some promise; their specific indications are unclear. Electroconvulsive therapy may still be the most reliable treatment for

severe depression, but some physicians and some patients avoid it because of its unpleasantness and because it appears to produce at least transitory organic brain dysfunction.

Many of the Institute's investigators focus on studies of brain and behavior. Emphasis is on research which involves direct manipulation of the central nervous system and the measurement of resulting effects on behavior; or conversely, on research in which measures of changes within the central nervous system follow behavioral manipulation. Scientists have made continued progress in the development of computer techniques to analyze patterns of brain electrical activity associated with various psychological states; further research using these techniques may lead ultimately to the use of refined computer analyses of neurophysiological data as aids in the diagnosis of various psychiatric states.

Recent concentration of scientific effort on the subject of sleep offers a singular example of the power that basic research can exert in penetrating the problems of mental health and illness. During the last decade, the study of sleep has contributed to the clinical diagnosis and treatment of diseases such as narcolepsy, to behavioral predictions in several mental disorders, and to an understanding of the effects of drugs and the development of more sensitive drug therapy.

In the psychological area, studies of how we perceive, how we learn, and how we communicate with one another, verbally and non-verbally, are essential to an understanding of how the brain works and to an uncovering of clues as to what goes wrong when it works abnormally. Studies of attitudes, values, and personality characteristics are being pursued in terms of their relationship to abnormal behavior and the factors that influence their development. Analyses not only of the results of psychotherapy but of what occurs during the therapeutic process itself are crucial in any effort to arrive at more effective means of treatment for mental illness. Many Institute research projects are concerned with psychological factors such as those noted above.

In searching for the causes of man's mental illnesses, however, investigators must look not only to the psychological factors in the life of the individual, but also to the society in which he lives. For the causes of mental illness are to be found not only within the individual and the family to which he was born, but also in the society of which he is a part. It is, therefore, one of the Institute's objectives to obtain more precise information about the role of social factors in behavior. A major vehicle, for example, is the conduct of research programs in psychiatric epidemiology. Knowledge of historical

trends helps determine whether a particular disorder is decreasing or increasing in incidence and prevalence, and information about the location and distribution of cases of the disorder aids in understanding causes and in planning health service programs. Other Institute-supported studies--for example, in social psychology and anthropology--aim to increase our understanding of the causes and effects of some of the fundamental characteristics of man's social behavior. Studies showing higher rates of mental disorders among persons at the lower socioeconomic levels are the basis for a number of investigations intended to help us understand the relationship between a variety of social factors and mental illness.

The Institute also supports a range of studies dealing with the cultural bases for mental illness and mental health. Its special interest in cross-cultural studies stems primarily from a more specific source--i.e., from an awareness of the importance to our knowledge about mental health of differentiating those aspects of behavior (including, of course, behavior disorders) which are uniform across cultures from those which are determined by forces unique to a given culture. The impact of culture factors on behavior can best be understood by studies of attitudes and behavior conducted within a specific, circumscribed cultural setting.

The importance of such research arises from the fact that the psychological and social stability of individuals is so closely related to their cultural and physical environment. Further knowledge of the intricacies of this relationship will improve our capacity to control and ameliorate socially and culturally based emotional illnesses.

4. Relationship of Objectives to PPB Program Structure:

2 1 1 A _ _	Mental Health and Illness
2 1 1 A 1 0	Basic Programs
2 1 1 A 2 _	Special Emphasis Programs
2 1 1 A 2 1	Affective Disorders
2 1 1 A 2 2	Biological Factors in Behavior
2 1 1 A 2 3	Brain Disorders
2 1 1 A 2 4	Psychoneurotic Disorders
2 1 1 A 2 5	Psychophysiologic Disorders
2 1 1 A 2 6	Other Character and Personality Disorders
2 1 1 A 2 7	Schizophrenia
2 1 1 A 2 8	Other Psychoses
2 1 1 A 2 9	Psychopharmacology

5. Non-applicable for "increasing knowledge" team report.

Program Operations

1. Federal action in the support of research on normal and abnormal human behavior as related to mental health and illness is necessary because the understanding yielded by such research has universal application in benefiting citizens throughout the Nation. Local governments participate significantly by bringing manpower resources, facilities, and special problems of study into union with Federal leadership, coordination, and funding.

2. The responsibility for meeting the heavy demands for direct service is carried by State and local governments. The support of major research efforts of universal, rather than unique State or local, application would place an unreasonable burden on resources already strained in meeting citizens' needs for direct services. However, research on mental health problems that are unique to a community or State should be provided local support. For instance, research on social-environmental factors peculiar to one locale, or on a community's organization characteristics, would be appropriate for State or local research support. The National Institute of Mental Health is promoting the development of such activity through initial funding of research elements in community mental health centers. Once begun, the research elements continue under local support. The Institute is also working with State-level research consultants to stimulate additional and increasingly effective State-supported research programs. The research is focused on problems of special relevance to the respective States.

Action necessary to promote greater State and local government responsibility extends to demonstrations of approaches that will ensure maximum local benefit from self-supported research. The demonstrations may encompass the growing technology, developed principally within Federal research grant programs, for assimilating the benefit of research into direct service programs.

3. Non-governmental participation in mental health research is significantly active. Profit-making institutions, such as pharmaceutical houses, expend considerable funds in the conduct of their own research on drugs related to mental illness. They also provide support to many mental health facilities for research that may include problems other than those related to drug treatment. Research on human behavior also is conducted by insurance companies and by industrial firms concerned with manpower effectiveness.

Non-profit institutions contribute to the national research operation by serving as sites for research that may be Federally funded. Their participation spans planning and designing of needed research, conduct of

the research, and collaboration in the diffusion of the new knowledge. When providing sites for research, these institutions share in the cost of the studies. National associations with local affiliates participate in the stimulation of research and utilization of findings. These organizations also fund research, but the related investment may be modest in comparison to the demand. More than fifty private foundations do provide notable funding of research in mental health. The support of research by profit-making institutions may be furthered through demonstrations of techniques to gain greater payoff through mental health research, similar to the approach that was suggested for State and local governments. The National Institute of Mental Health has taken action to promote the participation of private foundations through preparing and distributing directories and guidelines on such sources of mental health research funding. Staff consultants, through the use of these directories, work with investigators toward seeking full or partial project budget support by foundations.

Continued participation by non-governmental agencies is clearly desirable. However, the enormity and nation-wide urgency of specific mental health problem areas point to the impracticability and inadvisability of spinning off responsibility for problem areas.

4. Clients and local community citizens are being invited to participate in research related to social problems and mental health. This occurs through service on advisory or consultation panels developed to render the research efforts maximally responsive to actual needs and conditions. As a way to more efficiently meld the planning and utilization of research and social needs, this practice should be selectively encouraged.

5. Research on problems of normal and abnormal behavior is fundamental to the development of services to meet social needs. As findings emerge from research, new social responses will be called for in changing traditional patterns of action. Initially, the adoption of new patterns usually requires increased economic resources. However, current emphasis on cost-effectiveness measurements as part of scientific investigations, particularly with regard to tests of innovative service models, is ensuring optimum economy in the use of research results.

6. Continued Federal participation in mental health research is essential to the development of economical, coordinated, high-quality and well-utilized research findings relevant to the national need.

7. Extensive efforts are made to stimulate and support research to develop knowledge necessary for devising innovative practices and services to meet national mental health needs. As program models are developed, further support is provided to test their effectiveness in practical situations, so as to systematically diffuse the results of those tests toward broad national adoption. This program of research brings into recognition hindrances to progress, and leads to Federally-supported efforts to facilitate progress, such as conferences and publicity on the use of non-professional mental health manpower as developed and tested through research.

Evidence of Program Effectiveness

1. a, b, c. As indicated in Section I. A. 3 above it is apparent that the addenda to human knowledge, which are the "outputs" of a program of research support, cannot readily be quantified in output units. Instead, one must study the results of the many research projects and programs in an effort to evaluate their several or combined impacts upon the solution of major problems.

The principal outputs of scientific research are publications in the scientific literature--some reporting data, others developing theories relative to various natural phenomena (in this case, principally behavioral), still others engaging in a kind of contest of ideas to determine which best characterizes the world around us. It is difficult to quantify such outputs meaningfully. The fact that fifteen years of NIMH support resulted in more than 12,000 publications is an impressive indication of the scholarly activity generated by NIMH support. The many prizes, awards and professional honors awarded to scientists supported by NIMH research grants attest to the quality of researchers who are focal in the NIMH grants program.

The major evaluation activity built into the Institute's extramural research program involves the continuous, systematic review of the scientific merit of individual research projects and their relevance to the Institute's goals. Each proposal for a research project is reviewed by experts in relevant fields in terms of a variety of criteria, including: The scientific standing and scientific productivity of the investigator and his staff; the importance and relevance to mental health (including etiology, diagnosis, treatment, prevention) of the research project, and its potential contribution to the field; the design and feasibility of the study; its cost; and other considerations of policy and program administration. A dual system of review provides that the judgments of review committees are considered by the National Advisory Mental Health Council, which again applies criteria of scientific excellence, program relevance, and considerations of program policy to its assessment of research proposals.

An important aspect of this evaluation activity is the requirement that ongoing, grant-supported research projects be assessed by review committees before additional support is provided; that is, a mechanism exists for judging whether projects have made sufficient progress to deserve continued support. A continuing informal evaluation is also conducted by staff members in connection with their role in providing consultation and guidance to investigators.

At another and more indirect level, the presentations made by investigators to various professional societies serve as a medium for gauging the value of research programs. The reception accorded these, and also published papers and books [illegible] taken into account in the structured program review process.

The basic evaluation methodology utilized entails the judgments of experts - in effect, judges' ratings. Both regularly established review committees and ad hoc consultant groups analyze and consider published and unpublished data provided by the investigator, the results of site visits and interviews with research staff, the inspection of facilities and administrative procedures, and a variety of other "inputs." Based on their qualitative judgments, priority scores are assigned to research projects - thus providing a more refined basis for decision-making in the determination of those projects to be supported.

No single assessment of the entire research program in mental health is possible, but only of well-defined segments or aspects of the overall effort. It is for this reason that separate review groups - expert in one or another scientific field - provide assessments of research projects in a given field. Furthermore, even within a given field of scientific inquiry, no single criterion is adequate. The questions addressed to research programs differ depending on the specific segment of the program involved; various aspects of the program demand different sets of multiple criteria. In addition to those criteria cited above, the evaluation of basic research projects entails a broad range of considerations, among them: Number and type of publications resulting from the research; frequency and quality of citations in relevant literature; experts' assessments of research outcome; degree to which a given successful project stimulated a larger research effort; the public-education value of the research; degree to which the research served to advance the training and careers of mental health research personnel; potential applicability of research findings in clinical or service settings.

2. Response to this question appears in material provided in 1. a, b and c immediately above.

3. The program of research of the National Institute of Mental Health should not be consolidated with other programs within, or outside of,

DHEW. The research program of the National Institute of Mental Health is unique in the Federal government because of its clear focus on the prevention, control and amelioration of mental disorders and the promotion of mental health. No other agency within the Federal organization has the clear responsibility, expertise or forward momentum of this Institute for the study of mental health and illness.

Through its integrated program of research, training and services the NIMH is uniquely qualified to face the immense challenge of mental illness in contemporary America. Because of its well-organized, integrated approach it has been possible, for example, for the Institute to play a major role in effecting the continuing decrease in the number of patients resident in mental hospitals. The continued future success of the national mental health program rests heavily on the development of new basic behavioral knowledge, of new ways of applying such knowledge, of new methods of treatment, properly evaluated, etc. The NIMH not only has a history of successful and promising programs in these areas, but continues to demonstrate its capacity to mount new programs which can lead to important new knowledge.

Distribution and Recipient Data

Note A: The data reported in the tables in this section are based on the combined total of NIMH research grants applicable to both PPB categories 211 (Increasing Knowledge) and 221 (Disease Prevention and Control). Figures appearing in Part II, Budget Information, however, are limited to those research grants and direct operations costs classified under PPB category 211 (Increasing Knowledge).

1. This question is not applicable, because research grants are not distributed to States but rather to institutions, such as, universities, colleges, hospitals, public agencies, or nonprofit research organizations. In exceptional cases, a grantee may be an individual in the United States without an institutional affiliation.

2. See Table I: Program Recipients NIMH Research Grants - FY 1968

3. See Tables: II NIMH Research Grants FY 1968
State Locations of Sponsoring Institutions
III NIMH Research Grants
Ranking of States by Amount of Award - FY 1968
IV NIMH Research Grants
Ranking of States by Number of Grants Awarded - FY 1968

No funds are specified for target areas but are granted to institutions where there are qualified scientists, adequate facilities, and, in the case of clinical investigations, specified patient populations to carry out needed mental health research.

4. The program is not directly "defined to serve" particular target population, other than research investigators whose need or eligibility is based predominantly on scientific merit.

Publication of research findings is a significant index of scientific productivity. In this respect, the NIMH research grants program has been successful in serving the scientific population, as evidenced by an extensive survey of grantees, "Publications resulting from NIMH Research Grants, 1947-1961." This document lists 12,323 publications resulting from the research of 1,908 principal investigators, which represented 80% of the total number of principal investigators over the reported 15 year period.

Questions c and d are not applicable.

5. Material on question 5a will be provided in overall NIH document.

b. For FY 1968, <1% of total research awards ($636,000 of $67 million) and about 2% of total number of research projects (27 of 1,515) were to foreign recipients.

Foreign grants are awarded only if they meet the following conditions:

1. The research proposed (a) must be outstanding or original in concept, or (b) utilizes talents, skills, materials, or other resources not likely to be available in the United States; <u>and</u>

2. The proposal is of such a nature that the results are likely to advance significantly the status of the health sciences in both the country of the applicant and in the United States.

3. Further, new foreign research projects are limited to those which are urgently needed by the United States; cannot be carried on in the United States by either American or foreign scientists; and will not be financed by foreign countries despite specific efforts by the investigators to obtain such alternate financing.

Table I

Program Recipients NIMH Research Grants - FY 1968

Program Recipients	No.	%	Amount	%
Federal Agencies	--	--	--	--
Other Federal Agencies	--	--	--	--
Regional or Interstate	5	<1	159,979	<1
State Agencies	25	2	1,389,649	2
Local Community Agency	46	3	3,077,565	5
College or University	1,119	74	43,092,000	64
Private, elementary or secondary school	10	1	506,375	1
Individual	5	<1	47,451	<1
Hospital	158	10	9,193,377	14
Nursing Home	--	--	--	--
International Agency	5	<1	263,017	<1
Foreign Country	27		635,852	1
Other Institution Agency - Social Service	59	4	6,335,445	9
Other Institution Agency - Educational	4	<1	284,709	<1
Other Institution Agency - Health	--	--	--	--
Other	52	3	2,802,346	4
Total	1,515	100	67,787,765	100

DERP/PAES - April 21, 1969

See Note A,

ce A, NIMH Research Grants - FY 1968 Table II

TIONS OF SPONSORING INSTITUTIONS

STATES	1 Number	2 %	3 Amount	4 %
TES TOTAL	1,488	98	67,151,913	99
BAMA	11	1	370,007	1
SKA	-	-	-	-
ZONA	8	1	249,805	<1
ANSAS	3	<1	171,237	<1
IFORNIA	210	14	9,258,619	14
LORADO	24	2	998,549	1
NNECTICUT	43	3	1,777,511	3
LAWARE	1	<1	4,029	<1
STRICT OF COLUMBIA	35	2	3,352,895	5
CRIDA	20	1	740,686	1
ORGIA	9	1	159,822	<1
WAII	4	<1	120,873	<1
AHO	2	<1	147,734	<1
LINOIS	86	6	3,494,586	5
OIANA	26	2	1,023,395	2
WA	8	1	230,331	<1
NSAS	28	2	919,310	1
NTUCKY	10	1	363,963	1
UISIANA	9	1	341,803	1
INE	2	<1	124,231	<1
ARYLAND	42	3	2,663,245	4
ASSACHUSETTS	117	8	6,845,108	10
ICHIGAN	62	4	2,607,509	4
INNESOTA	23	2	936,769	1
ISSISSIPPI	7	<1	255,849	<1
ISSOURI	31	2	1,740,578	3
ONTANA	3	<1	32,904	<1
EBRASKA	5	<1	139,676	<1
EVAOA	3	<1	77,225	<1
EW HAMPSHIRE	3	<1	165,194	<1

EW RSEY	37	2	1,805,715	3
EXICO	7	<1	272,637	<1
EW ORK	246	16	13,193,650	19
OR CAROLINA	34	2	1,065,701	2
OR DAKOTA	3	<1	12,759	<1
HI	55	4	1,527,706	2
KL OMA	8	1	306,213	<1
RE N	20	1	1,015,337	1
EN YLVANIA	88	6	3,615,459	5
HO ISLAND	15	1	339,789	1
OU CAROLINA	1	<1	67,152	<1
OU DAKOTA	2	<1	23,503	<1
EN SSEE	19	1	940,127	<1
EX	34	2	1,312,820	2
TA	10	1	202,799	<1
ER NT	4	<1	125,231	1
I INIA	9	1	100,728	<1
A INGTON	27	2	580,193	1
E VIRGINIA	3	<1	26,861	<1
ONSIN	29	2	1,155,684	2
Y ING	2	<1	148,406	<1
eign	27	2	635,852	1
al Total	1,515	100	$67,787,765	100

DERP, PA&ES April 21, 1969

NIMH Research Grants
Ranking of States by Amount of Award - FY 1968

State	Amount
New York	$13,193,650
California	9,258,619
Massachusetts	6,845,108
Pennsylvania	3,615,459
Illinois	3,494,586
District of Columbia	3,352,895
Maryland	2,663,245
Michigan	2,607,509
New Jersey	1,805,715
Connecticut	1,777,511
Missouri	1,740,578
Ohio	1,527,706
Texas	1,312,820
Wisconsin	1,155,684
North Carolina	1,065,701
Indiana	1,023,395
Oregon	1,015,337
Colorado	998,549
Tennessee	940,127
Minnesota	936,769
Kansas	919,310
Florida	740,686
Washington	580,193
Alabama	370,007
Kentucky	363,963
Louisiana	341,803
Rhode Island	339,789
Oklahoma	306,213
New Mexico	272,637
Mississippi	255,849
Arizona	249,805
Iowa	230,331
Utah	202,799
Arkansas	171,237
New Hampshire	165,194
Georgia	159,822
Wyoming	148,406
Idaho	147,734
Nebraska	139,676
Vermont	125,231
Maine	124,231
Hawaii	120,873
Virginia	100,728
Nevada	77,225
South Carolina	67,152
Montana	32,904
West Virginia	26,861
South Dakota	23,503
North Dakota	12,759
Delaware	4,029
Total	$67,151,913

A,

NIMH RESEARCH GRANTS
RANKING OF STATES BY NUMBER OF GRANTS AWARDED

RANK	STATE	NUMBER
1	New York	246
2	California	210
3	Massachusetts	117
4	Pennsylvania	88
5	Illinois	86
6	Michigan	62
7	Ohio	55
8	Connecticut	43
9	Maryland	42
10	New Jersey	37
11	District of Columbia	35
12	North Carolina	34
	Texas	34
14	Missouri	31
15	Wisconsin	29
16	Kansas	28
17	Washington	27
18	Indiana	26
19	Colorado	24
20	Minnesota	23
21	Florida	20
	Oregon	20
23	Tennessee	19
24	Rhode Island	15
25	Alabama	11
26	Kentucky	10
	Utah	10
28	Georgia	9
	Louisiana	9
	Virginia	9
31	Arizona	8
	Iowa	8
	Oklahoma	8
34	Mississippi	7
	New Mexico	7
36	Nebraska	5
37	Hawaii	4
	Vermont	4
39	Arkansas	3
	Montana	3
	Nevada	3
	New Hampshire	3
	North Dakota	3
	West Virginia	3
45	Idaho	2
	Maine	2
	South Dakota	2
	Wyoming	2
49	Delaware	1
	South Carolina	1
TOTAL		1,488

DERP, PA&ES April 21, 1969

Budget Information

NATIONAL INSTITUTE OF MENTAL HEALTH
Division of Extramural Research Programs

Program Planning Budget System
INCREASING KNOWLEDGE

	1968	1969	1970
Increasing Knowledge			
Mental Health and Illness			
Basic Programs	19,978	20,354	20,408
Special Emphasis Programs			
Affective Disorders	322	328	329
Biological Factors in Behavior	7,697	7,842	7,863
Brain Disorders	358	364	365
Psychoneurotic Disorders	71	72	72
Psychophysiologic Disorders	214	218	219
Other Character and Personality Disorders	72	73	73
Schizophrenia	465	474	475
Other Psychoses	14	14	14
Psychopharmacology	6,612	6,739	6,757
Research Grants	35,803	36,478	36,575
General Research Support	5,483	7,755	7,863
Scientific Evaluation	375	375	375
Other Research Support	5,858	8,130	8,238
Research Contracts	1,012	953	953
Personnel and Other Objects 1/	936	2,036	2,054
Direct Operations	1,948	2,989	3,007
Increasing Knowledge	43,609	47,597	47,820

ector's Reserve of 270 included in 1969 and 1970.

NATIONAL INSTITUTE OF MENTAL HEALTH
Division of Extramural Research Programs

Program Planning Budget System

I̅C.1

There is no anticipation for a reduction in force, as it is felt that the present level of staff is essential for effective administration and monitoring program output.

IIC.2

For FY 1970, 45,386 or 77% of our requested budget is already committed to provide support for research projects whose continuation has previously been recommended by the National Advisory Mental Health Council.

Legislative Changes (recent)

This section is not applicable.

Forward Plan

A. National Goals, Needs and Program Objectives

The ultimate goal of the mental health research programs is to prevent, control and ameliorate mental disorders. In order to reach this goal the Institute supports studies in a variety of fields to provide the scientific groundwork for sound approaches toward the prevention, diagnosis and treatment of mental illness and the promotion of mental health.

Scientists throughout the United States, and some abroad, supported by NIMH grants, utilize a wide range of approaches to investigations of human behavior, including clinical, epidemiological, psychopharmacological and applied research. Support is provided for a broad spectrum of studies, including research in genetics, biochemistry, neurophysiology, psychiatry, psychology, sociology, anthropology and related disciplines.

Many of these studies focus on specific psychopathological phenomena. Clinical research is conducted on the causes, diagnosis, prognosis and treatment of the mental disorders. Psychopharmacological research is conducted on the ways in which drugs influence thought, mood and behavior and to evaluate and improve the use of drugs in the treatment of mental illness. Applied research is directed at improving the quality of mental health services delivered to the public. Special research efforts are directed toward specifically identified problem areas of special social significance, including alcoholism, narcotic and other drug abuse, mental health of children and families, crime and delinquency and suicide prevention. Basic behavioral research, to obtain normative data on physiological, psychological, and social growth, is also an integral part of the Institute's program. The results of such research provide the baselines from which deviations in human development can be measured and understood, and the insights by which many of the origins of mental illness can be identified. The Institute's overall research effort also reflects an important feature of its mission: emphasis on mental <u>health</u> as well as illness, on work designed to enhance the individual's potential--intellectual, emotional, social, cultural--as well as to resolve specific problems of psychopathology.

A goal of all of these research activities, over and above increasing substantive understanding of mental health-related areas, is the improvement of research methodology to render subsequent research efforts more effective.

The desired objectives of the mental health research program must be met gradually. Research necessarily operates in a step-by-step fashion, each research result leading to additional research questions while adding to the store of knowledge. The major "non-dollar" constraints which delay the achievement of our research goals are new technological developments, availability of research manpower and research facilities; but most importantly, the elusiveness of the critical elements of knowledge. We are engaged in a search for the "key" to the mysteries of determination of normal and abnormal behavior. The search requires scholarship, patient sifting of leads, making insightful associations of bits of knowledge which together form a meaningful whole.

Program Requirements

1. It is very difficult to designate appropriate measures of program output for a research program. Our goals are massive and global in nature--the prevention, control and amelioration of mental disorders--the steps toward these goals are slow, progress occurring as additional knowledge accrues on the many specific and general research questions under attack.

Thus, it would be most unrealistic to attempt to outline a timetable of research outputs, discoveries, breakthroughs, etc. to be expected over each of the years between FY 1971 and 1975. We can say, however, that a major disruption or curtailment of research support would necessarily slow down the rate of accrual of new knowledge in our area.

Detailed statements of samples of program outputs are presented in Section I. A. 3 above. We need support adequate to (1) maintain the present momentum of mental health research, (2) utilize effectively presently available research manpower and facilities, (3) have adequate opportunity to exploit promising research findings and (4) to have the capacity to add to the effort new investigators with promising new ideas and approaches.

If the level of research support available were fixed at the FY 1970 amount, allowing for no additional funds beyond those required to meet cost-of-living increases, it is highly likely that the breadth of the mental health research program would have to be curtailed. The range of interests would have to be sharply delimited, the opportunities available to new investigators or for following new leads necessarily be very much restricted; the rate of application of new knowledge to mental health problems would be greatly slowed.

There is a real risk that curtailment of research efforts and reduction of the pace of application of new knowledge could result in prolongation of suffering by the thousands of patients, afflicted with mental diseases.

I. FY 1971 - 1975 Estimates

	1971	1972	1973	1974	1975
211					
Research Grants	42,793	50,068	58,580	68,539	80,191
Scientific Evaluation	425	450	475	500	525
Research Contracts	3,025	4,000	5,500	7,000	9,000
Personnel & Other Objects	2,984	3,400	3,750	4,100	4,500
Subtotal	49,227	57,918	68,305	80,139	94,216
General Research Support	10,838	12,681	14,172	20,831	24,372
TOTAL	60,065	70,599	82,477	100,970	118,588

II. FY 1971 - 1975 Estimates Necessary to Meet Minimum Program Needs

	1971	1972	1973	1974	1975
211					
Research Grants	39,917	42,866	46,035	49,442	53,105
Scientific Evaluation	425	450	475	500	525
Research Contracts	1,025	1,100	1,185	1,275	1,375
Personnel & Other Objects	2,984	3,000	3,200	3,350	3,600
Subtotal	44,351	47,416	50,895	54,567	58,605
General Research Support	10,110	10,857	13,991	15,027	16,140
TOTAL	54,461	58,273	64,886	69,624	74,745

N.B. The above figures no not include Intramural Research Programs

NIH INTRAMURAL RESEARCH

FOR

INCREASING KNOWLEDGE

Program Report and Plan

Office of the Associate Director for
Program Planning and Evaluation

Office of the Director, NIH
May 1, 1969

ERRATA

The tables on pages 52-59 inclusive are incomplete. The correct tables appear in Appendix III of the Chairman's Report.

211

SUMMARY: NIH INTRAMURAL RESEARCH FOR INCREASING KNOWLEDGE

oals. The pertinent goal of the NIH is the development of basic nowledge bearing on the prevention, alleviation, and cure of disease ith a view to improving the quality of human life as well as lengthen-ng its span.

rogram Objectives. The objectives of the NIH direct operations are o provide an essential "national health resource" of biomedical research apabilities and leadership, to furnish technical direction and support or targeted collaborative activities aimed at areas of major opportunity r need, and to afford a special intramural training opportunity for uture leaders in medical research and education.

pproximation of Objectives to Needs. The needs in the health area annot be specified by numbers alone; based on what we do not understand bout many serious illnesses, the need for increased knowledge is mmeasurable. But within the constraints of available facilities, rained manpower, present base of knowledge and technological state of he art, efforts are sustained on a broad front to develop the essential ew knowledge for advancing the Nation's health.

ollars. Unless there is a growth in funding of at least 10-11% per ear to offset inflationary costs in wages and increased costs of doing esearch ("sophistication factor"), there will be an inevitable decrease n the real level of effort and output. To respond to the needs and pportunities in health research, it is recommended that the intramural rograms grow at about 19% annually, while contract activities be dvanced at a faster annual rate of 23%, between 1970 and 1975.

egislation. The research contract authority in the Public Health ervice Act [Section 301(h)] expires on June 30, 1971, and should be xtended.

dministrative Changes. The new National Eye Institute intramural rograms will require implementation through assignment of space, ransfer of pertinent activities from NINDS, etc.

Outside Perspective :

The consultant group which reviewed this report on intramural research expressed the view that the required format did not enable strong enough emphasis to be placed on the uniqueness of the intramural program as a "national resource" making major contributions in health research. It was pointed out that the overall quality of administration of all the various NIH programs is greatly enhanced by the fact that this administration is conducted in close proximity to and interaction with the atmosphere of scientific inquiry and scholarship afforded by the intramural staff. The consultants stressed the fact that intramural activities did not compete with those of academic institutions but provided an essential complement to the latter. They felt it desirable that the direct research components be enabled to grow in an orderly fashion.

NIH INTRAMURAL RESEARCH FOR INCREASING KNOWLEDGE*

PROGRAM REPORT AND PLAN

I. PROGRAM BACKGROUND

The NIH intramural research activity has played a traditional and historic leadership role in the conduct and support of biomedical research. Its beginnings originated with the Laboratory of Hygiene, established in 1887 at the Marine Hospital in Staten Island, which was subsequently moved to Washington, D.C. as the Hygienic Laboratory, and became the National Institute of Health in 1930 and "Institutes" in 1948. Extramural grant programs did not become a major feature of NIH activities until 1946, but simply because these programs now constitute the major portion of appropriations should not detract from the salient fact that NIH remains, fundamentally, an effective and highly respected research institution.

Definition of Program: For purposes of this discussion, the programs involved should be more properly referred to as the direct research programs of the National Institutes of Health. They comprise a composite of the laboratories and clinics on the "campus" in Bethesda, Maryland, the facilities at off-campus sites and the contract operations of the Institutes, most of which are identified under "collaborative programs" in budgetary documents.

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* This report covers not only the NIH intramural research programs, but also the intramural research program of the National Institute of Mental Health (NIMH), for most of which the NIH has joint administrative responsibility, i.e., the laboratories located on the Bethesda campus. The NIMH intramural research program has the same general objectives as the NIH programs, and operates under similar policies. For simplicity's sake the designation "NIH" is used in this report to refer to all of the NIH and to the NIMH intramural program as well.

The laboratory complex at Bethesda represents the largest full-time l.omedical research effort in the world. The staff is organized into ıearly 100 separate "laboratories," each devoted to a particular research ɔjective. Occupying over 700,000 square feet of laboratory and djunctive space on the Bethesda campus and 16 off-campus sites is a otal population of 4,500 scientists and supportive personnel. Central o the Bethesda campus is the Clinical Center with its modern 500-bed esearch hospital and over 230,000 square feet of laboratory and ancillary pace, most of which is related to clinical research. First occupied in .952, it admitted 1,452 research patients in 1954 and reached its maximum ıperating capacity of about 4,000 patients per year in 1962. Research ıatients are referred to the NIH by their own physicians on the basis of :he clinical research projects currently being investigated by the various Institutes. These projects are described in a pamphlet circulated to ɔhysicians in the United States. With the exception of a few emergency and ıumanitarian admissions each year, all patients are admitted only for research purposes and there are no charges to the patient for his participation. There are surgical facilities for clinical research in heart diseases, cancer, and neurological diseases. Medical services include those for cancer research, which has pioneered in chemotherapy, investigations into allergy and infectious diseases, arteriosclerosis, hypertension, rheumatic heart diseases, arthritis, metabolic diseases, genetics in enzyme systems and synthetic mechanisms, cleft palate and other embryologic abnormalities of oropharnyx, Parkinson's disease, brain tumors, mental retardation, psychatric disorders, and a host of other medical problems. A major

vantage is being able to collect in one area enough patients with certain ce disorders to enable definitive studies or therapeutic trials in a ort time. For instance, a high percentage of the total number of known ving patients with Chediak-Higashi, Gaucher's, Niemann-Pick, and other ndromes are being followed. In such patients and their relatives, it s been possible to define inborn metabolic errors and the genetic relationips of such errors. The Clinical Pathology Laboratory has pioneered automated clinical laboratory procedures; many of the more recent velopments in this area can be traced to this laboratory. Other pioneerg efforts have been in "Life Island ," automated collection of blood atelets, surgical techniques, and computer technology in patient nitoring.

The professional staff, numbering about 2,100, is comprised of mmissioned Officers in the U.S. Public Health Service, Civil Service ployees, NIH Postdoctoral and Staff Fellows, Associates entering as mmissioned Officers, visiting scientists, and guest workers.

Intramural laboratories and clinics are organized around the basic ructure of a "Laboratory" of anywhere from 10 to 50 people. The boratory Chief, appointed by the Director, NIH, is responsible for the search program of his laboratory. The director of intramural research responsible for all laboratories in his Institute and through the inical director, all clinical research. The organizational pattern flexible and laboratories are established or reorganized as senior vestigators who head them embark on new ventures which require a grouping staff, or as they leave and the supporting staff are reassigned into her research groups.

The collaborative programs are organized programs with definitive
ojectives requiring both a resident scientific staff at the NIH and
ontract operations with academic institutions, non-profit institutions
r industrial concerns. The scientific base in the NIH varies from large
roups conducting both laboratory and clinical research such as in the
ational Cancer Institute's cancer chemotherapy program to small groups which
orrow part-time talent from NIH and elsewhere to obtain scientific guidance
n the development and distribution of research reagents such as in the
ational Institute of Allergy and Infectious Diseases. In general,
hese represent the recognition by the scientific community at NIH that an
rea of research has reached a point where practical results can be
chieved by a targeted program. Intramural staff are generally responsible
n genesis of the program through review of the state of the art and
he decisions as to what problems must be solved to achieve the goal, for
onitoring of the contractors' performance, and in arranging for periodic
evaluation of the progress.

Biometrics, epidemiology, and field programs also represent an extension of intramural programs to other sites and is represented by such entities as the Framingham, Massachusetts, Heart Disease Epidemiology Study, the Childhood Leukemia Study in Boston, and the Epidemiology and Genetics Center of the Neurology Institute on Guam.

The following table (Table 1) provides data on the comparative staffing and funding levels of the Direct programs in the several NIH Institutes and the National Institute of Mental Health for FY 1970.

(Includes Amounts Paid into Management Fund for
Research and Administrative Services.)
(Dollars in Thousands)

Institute	Total Direct Operations		Laboratories and Clinics		Biometrics, Epidemiology & Field Studies		Collaborative	
	$	Pos.	$	Pos.	$	Pos.	$	Pos.
Cancer	82,227	1,291	17,045	473	1,476	89	63,706	729
Heart	32,194	470	13,504	375	1,721	64	16,969	31
Dental	5,554	221	4,712	217	--	--	842	4
Arthritis & Metabolic	22,193	538	15,391	487	711	26	6,091	25
Neurology	19,161	489	9,876	290	--	--	9,285	199
Allergy & Infectious	27,254	642	15,072	603	--	--	12,182	39
Child Health	14,828	296	6,021	236	2,086	23	6,721	37
Mental Health	20,827	649	18,125	611	853	38	*	*
Eye	752	40	752	40	--	--	--	--
Environmental Health	5,316	186	5,316	186	--	--	--	--
Biologics Stand.	8,225	280	--	--	--	--	--	--
Computer	4,646	112	--	--	--	--	--	--
TOTAL	243,177	5,214	105,814	3,518	6,847	240	115,796	1,064

*NIMH has a few contracts in support of direct operations, but these are not classified as collaborative progra

A. Program Objectives

1. What they are:

In carrying out its mission of supporting the development of basic knowledge bearing on the prevention, alleviation, and cure of disease, the NIH conducts intramural programs which have the major objective of serving as a "national health resource" of biomedical research capabilities and leadership. They provide an essential science base for the broad substantive decisions which contribute to determination of the allocation of Federal resources, furnish technical direction for the wide ranging collaborative activities supported via contracts, and afford a unique at-the-bench training opportunity for young scientists who will become future leaders in medical research and education. As a prototype medical research institution, the intramural laboratories have set standards of excellence which other establishments have striven to emulate, and it should be noted that the quality of program management for the entire extramural operations derives in large part from, and depends upon, the quality of the intramural activities of the various institutes and divisions.

Specific research goals and objectives of the intramural programs of the various Institutes are the same as for their extramural activities. A descriptive listing of these is presented as Appendix A of the Program Report on NIH Extramural Research.

2. Legislative Authority for Intramural Research

Section 301 of the Public Health Service Act of 1944, as amended, states that the Surgeon General (that is, The Secretary) "shall conduct in the Service, and encourage, cooperate with, and render assistance to other appropriate public authorities, scientific institutions, and scientists in the conduct of and promote the coordination of, research, investigations, experiments, demonstrations, and studies relating to the causes, diagnosis, treatment, control and prevention of physical and mental diseases and impairments of man . . ."

This broad legislation empowers the Secretary to conduct research directly at PHS facilities such as those of the National Institutes of Health; to cooperate with appropriate public authorities or scientists, or scientific institutions in the conduct of research; to make PHS research facilities available to health officials and scientists engaged in special study; to establish and maintain research fellowships in order to have the assistance of promising research fellows from the U.S. and abroad; to secure the assistance of experts, scholars, and consultants from the U.S. or abroad; and to admit and treat, for purposes of study, at PHS institutions and hospitals, persons not otherwise eligible for such treatment.

The authorizing legislation for these activities does not prescribe any level of authorization or any date of expiration of the authority.

3. Outputs and Levels of Last 3 Years.

Research output obviously cannot be quantified by numbers alone. A significant research discovery (e.g., the rubella vaccine) per decade may provide adequate justification for support of a broad spectrum of activity over the same period. But while total outlays may be rationalized on this basis, the marginal outlays, for which measurement techniques and data are lacking, cannot be so treated, and this is true for many Federal programs.

In several important areas, biomedical research appears to have established the preconditions for another stage of rapid growth. The breaking of the genetic code, the application of computer technology and information sciences to biologic phenomena, and the advances in virology, physiology, and other fundamental disciplines lead to the expectation of even greater advances within the coming decades than has already occurred, providing that the existing impetus can be maintained by adequate support.

One general indicator of research "activity" by NIH staff is the number of scientific and technical publications (books and articles) listed each year in the "Scientific Directory and Annual Bibliography." In the world of science, this indicator

is a standard measure especially if one also considers the quality of the journal in which the work was published and the significance of the findings reported.

Year	No. of Publications
1968	2,443
1967	2,178
1966	2,302
1965	1,990

In 1956, only 971 publications were listed, and there had been a steady increase from that time until the leveling off in 1966 coincident with leveling rates of growth of the intramural research programs.

4. Objectives as Related to PPB Program Structure.

The PPB "program structure" maps the broad scientific base which provides the framework within which the individual intramural programs of the NIH carry on their activities. The higher levels of categorization define the broad goals and objectives, e.g., development of health resources--of which increasing knowledge is a component, while the detailed breakdown for the individual institutes furnishes a spotlight on their various special emphasis programs as well as denoting the important function served by their basic research programs.

5. Prevention Rather than Treatment.

As a guiding philosophy in medical practice, prevention of disease conditions is always preferred to their subsequent treatment. But it is evident that, in the real world, solutions

to the problems of disease and malnutrition demand a multifaceted attack on a number of fronts. Our present basic knowledge of many illnesses is so limited that we must utilize both curative and preventive approaches in the hope that ultimately our understanding of the problem diseases will be sufficient to permit a rational approach to their eradication or control.

An example where preventive measures are particularly effective is in the development of vaccines (as against Rubella and the respiratory viruses).

In many conditions, preventive measures, though based on empirical observations or evidence, could have a much improved impact if properly exploited by the medical profession and accepted by the public. Additional efforts on the part of the Federal sector may be required. Examples include:

- Prevention of lung cancer and emphysema by reduction in cigarette smoking, air pollution, and chronic respiratory infections.
- Prevention of dental caries by fluoride treatment and anti-bacterial agents.
- Prevention of chronic kidney disease by early diagnosis and treatment of predisposing conditions.
- Prevention of heart disease by control of diet, proper exercise, and other measures.

In fact, the basis for all the fundamental research being conducted in NIH laboratories is to obtain an understanding of the underlying causes behind disease processes, with the ultimate intention of preventive control. Continued support of these basic investigations is therefore most essential. While short-term gains might be achieved by a diversion of resources into entirely curative or applied studies, the net effect would be detrimental over the long term.

B. Program Operations

1. What is the basic rationale for Federal Government action in this area?

The basic rationale for the federally supported intramural research programs at the NIH derives from:

- the legislative mandates given to the various categorical Institutes, e.g., "to conduct researches, investigations, experiments, and studies . . ."
- the contributions of the intramural research program to the overall missions of the Institutes in the way of providing comprehensiveness of approach, scientific guidance, prestige, and unequalled opportunity for the development of future leaders.

As leaders in the forefront of biomedical research, and with a Federal mission responsibility, the intramural programs are in a particularly auspicious position to develop and exploit those special or major opportunities which may arise at unpredictable times. In its scope, resources, and uniquely qualified staff, the NIH laboratories constitute a research facility unmatched anywhere. Thus the intramural program represents a special thread in the fabric of research in its ability to:

-- Initiate and perpetuate programs requiring long-time commitments perhaps extending beyond the lifetime of a single individual.

-- Support research requiring large-scale and costly resources.

-- Conduct studies which involve a high probability of failure (e.g., hepatitis, slow viruses, prolonged exposures to low concentrations of toxic chemicals).

-- Fill in gap areas in which interest may have declined and where few spontaneously generated applications come in from the outside for grant support.

Mention must also be made of the special obligation of NIH, as a Federal research resource, to maintain a capability to control infectious diseases seldom seen in this country. Many Americans other than the military are exposed in international travel or residence abroad to rickettsial diseases, malaria, and other disease problems not common to domestic medicine. Although expertise in these areas is rapidly disappearing from this country's academic sector, the global commitments of our Nation require that, as a matter of public policy, such competence be maintained. This responsibility has been assumed by intramural NIH laboratories.

2. What is the involvement of State and local government in this area?

The "direct" operations of NIH include contract supported collaborative activities as well as intramural research in its own laboratories. Some of these activities are carried out in State-operated facilities. For example, Health Department Laboratories, though primarily diagnostic, may carry on research (largely oriented in the past to control of communicable diseases). This research often has been supported, in part, by Federal funds.

a. Proper share of burden by Federal, State and local government?

Probably yes. The overwhelming share of the medical research burden can only be borne by the Federal Government. Direct research support and intramural NIH activities will continue to be Federal programs.

b. What action is necessary for local and State government to assume greater responsibility?

Their contributions to the direct research efforts of NIH will be dependent upon Federal initiative and funding.

3. What is the present role of non-governmental participation in this area?

This is significant in the overall field of biomedical research but is highly dependent on the Federal sector for financial support either by extramural grants or through contract supported collaborative activities.

a. Profit-making institutions?

These concerns, primarily pharmaceutical companies, fund their own in-house research activities which may be related in various ways to those of NIH scientists. Several, notably Squibb, Merck Sharp and Dohme, and Hoffman-LaRoche, have established nonprofit research institutes which do research closely parallel with that of some NIH intramural groups. Such activities if at the basic research level or if devoted to development of new drugs or biologicals do contribute to the pool of knowledge. But profit-making institutions are also an important instrument in the direct operations of the NIH by performing research projects, under contract, which are aimed at developing applications of new information to the health needs of the country.

b. Non-profit institutions and association, including community groups of all kinds?

Nonprofit research institutions may derive a large segment of their support from Federal funds through either contracts or grants. They also channel funds from other sources into biomedical research which may parallel various activities of the intramural research programs. Notable would be the cancer institutes such as Sloan-Kettering in New York City; Roswell Park at Buffalo; and M.D. Anderson in Texas which are closely allied to the overall efforts to combat cancer.

c. Individual volunteers:

Not applicable.

d. How can role of each of the above in this area be increased?

This could be done by decisions to shift emphasis from intramural activities to extramural grants or contract funding directed at specific goals in defined institutions or by creating additional outside institutes in other disease-oriented areas of research which can attract non-Federal sources of funds to complement Federal funds.

e. Can all or any part, however small, of this program be spun off to any of the above? If so, how?

Not applicable.

4. What is the role of the client or local community population in the program and how can it be strengthened?

This is mostly applicable to the NIH extramural programs.

5. In attempting to meet current social needs, what new social and economic problems may be created by this program?

Advances in knowledge concerning the treatment of disease potentially have wide impact in social and economic terms. For example, the past accomplishments in the treatment of infectious diseases through vaccines and antibiotics and of the psychoses and other behavior disorders with drugs has resulted in a shifting from hospital to outpatient treatment with consequent alteration in patterns of care by physicians and other health agencies. Profound effects on the availability of health

manpower and other resources would be expected for breakthroughs in other conditions now receiving major fractions of effort. There could be a sudden release of personnel and facilities presently engaged in research and patient care on specific diseases, and the deployment of these released resources to other problems will then require thoughtful consideration.

As the older population achieves better health and longevity, significant effects will be produced on programs dealing with housing, transportation, and retirement benefits, to name only a few. Reductions in morbidity and mortality in both young and old will have consequences on the numbers of individuals in those population groups, thus altering the overall pattern of social demands.

Enormous financial, moral, and ethical problems are raised by the advances in organ transplantation and artificial organ replacement. The costs of treatment will be so high, and availability of treatment so relatively limited, that these areas of endeavor will have to be approached with careful analysis of all the possible consequences.

When, if ever, can Federal Government participation in this area be phased out?

Owing to the health mission-oriented nature of NIH's activities and the importance of its intramural research program in providing scientific guidance, leadership, and supportive background for this mission, it would be impossible to eliminate this sector of NIH without deep and irreparable damage both to the NIH itself and to the biomedical research effort of the Nation as a whole. As long as the NIH retains the health research and education mission, the intramural program will comprise an essential component.

a. To what extent is the program attempting to provide models and experiments for new ways to attain national goals?

In the diagnosis of disease and provision of health care, accurate and rapid analyses of blood and body constituents are essential. Further, the high prevailing cost of such techniques must be reduced. A prototype computerized and automated clinical laboratory system is being developed in the central laboratories of the NIH Clinical Center. It will be on the basis of this type of equipment that the whole area of diagnostic screening and laboratory analysis will soon undergo revolutionary changes.

The virus development programs, especially as related to cancer, also fall into the category of model systems. A separate virus isolation facility built on the NIH grounds for the cancer virus program has been especially designed for research on such potentially hazardous biomaterials.

In the field of dental health, investigations on the role of bacteria in dental caries and periodontaldisease is providing a rational basis for the development of preventive and therapeutic approaches to these conditions.

The sphere of contract-supported collaborative activity illustrates various innovative ways for the Federal Government to support direct research in an area of specially recognized need, either to shorten the time required for solution to problems or to initiate activity in a field where otherwise nothing would take place. An example, drawing from studies on virus diseases, is given below. Similar stories could be told about collaborative programs from Cancer, Allergy and Infectious Diseases, Heart, etc. Each would be a variation on the general theme of directed research at problems of special need or special opportunity.

"Interferon is a protein which is manufactured by body cells of all mammals in response to infection or certain other injury processes. By the 1960's, it had become evident from basic research that this constitutes a major mechanism by which the body defends itself against viral infections and terminates such an infection at the cellular level. A

scientist at the Merck Institute for Therapeutic Research showed that synthetic double-stranded ribonucleic acid would stimulate the body to produce large amounts of interferon. A scientist from the NIH then showed that it was possible not only to prevent virus infections of the rabbit eye by injection of this synthetic product, but to significantly influence the progress of the established infection. Another NIH scientist then found that the same synthetic product would cause regression of certain types of animal tumors.

These demonstrations of therapeutic effectiveness suggested a possible new method for treating and preventing virus diseases and, in addition, providing a valuable adjunct to cancer chemotherapy. This has led to widespread collaboration between NIH scientists from several institutes in testing the safety and effectiveness of these products in animals. If these studies indicate that viral infections or cancer can be favorably influenced by interferon inducers, an organized program will be initiated to develop supplies of such inducers for human clinical trials, to arrange for the trials, to evaluate results, and to define the ultimate usage and benefits of such usage. Since many of the viral infections which cause severe or fatal illnesses (rabies, viral encephalities, infectious hepatitis) are seen so infrequently at individual institutions having capabilities

for conducting therapeutic evaluations, several years time can be saved in testing by an NIH-initiated evaluation program which supplies the safety-tested product for trials within a defined protocol situation and utilizing the entire hospital system of the United States. Such a program could bring a new product more quickly into public use."

b. To what extent do obsolete rigidities hinder progress in the program area, as for example:

   * in certification requirements

   * in inhibiting substitution of sub-professional personnel

   * in absence of competition.

Despite the excellent reputation which is associated with the intramural program, there are several factors which cause chronic and recurring problems.

- Noncompetitive salaries. Existing and prospective salary scales in government, both in Commissioned Corps and Civil Service, have attempted to maintain some relationship with the averages in industry and universities. But the people to be attracted to meet our needs are not the average. They are the exceptional, the gifted, the creative, and the highly productive. Restrictions on flexibility in salary scales and mode of appointment (208g --Super grades) as well as the range of salaries in some areas, are constrictive.

The opportunity to pursue independent research in well-equipped laboratories provides an offsetting compensation to make up, in part, for lower salaries in the case of physicians and scientists. But in the supportive technical areas such as "biomedical engineering," such factors are not as important, and the NIH is less well able to compete for qualified personnel. Often then, the only way to obtain such expertise is to purchase services on the outside via the contract mechanism. In many cases, it would be advantageous to be able to have the same capabilities "on campus."

- Inadequate fringe benefits. The mature and responsible scientist or science administrator must often be attracted from the university or industrial area. There he has developed the qualities which are desired and which qualify him for a 208(g) or GS-18 rating. Yet after his appointment his annual leave and other prerogatives are the same as for the high school dropout entering at a low level. The university professor, accustomed to a 9 or 10 month work schedule, with summers free for scholarly pursuits and self regeneration is suddenly confronted by an entitlement which permits no

absence for 90 days and an accumulation of only 13 (working) days away from his job per year for the first three years! This shock is compounded when he sees his newly acquired physician trainee in the Commissioned Corps get 30 (calendar) days the first year and every year thereafter. He is also dismayed to find that he has no capacity to increase his earnings by consulting for outside organizations, and is limited in his ability to volunteer his service with any degree of recompense to teaching or other professional groups, even if his government work exceeds the legal requirement of 40 hours per week.

- The rigidities of the Civil Service and Commissioned Corps make it difficult to shift direction rapidly or to eliminate areas of research which have been outmoded or become unproductive. The protections afforded government employees in any Federal cuts in personnel levels, such as at the present, which require that cuts be accomplished only by attrition, discourages vigorous and productive scientists and tends to retain the placid and mediocre.
- The failure to delegate authorities to the operating echelons and the tendency in times of stress to make decisions at levels further removed from the operating levels also hamper research efforts.

- Incentives for industry: To fully reap the benefits of many biomedical advances, the manufacture, sale, and distribution of devices by the private industrial sector will have to be stimulated. Operating as they do on a profit motive and return-on-investment, the full exploitation of contributions from this sector cannot be achieved without the use of appropriate incentives by the Federal Government. Tax incentives, revised patent regulations, or even direct subsidies may be necessary.

c. What can be done about it?

Personnel Recruitment and Retention: The basic problem is to increase the salaries for scientists and managers in short supply. A variety of methods could be used, including the greater allocation of restricted supergrade positions, the inclusion of behavioral scientists among those eligible for unrestricted supergrades, and, in the case of commissioned officers approaching retirement, the use of the dual compensation provisions to permit re-employment under Civil Service. Seek changes in the law to permit a more liberal leave benefit for those who enter the Civil Service at older ages and at higher grades. In interim, afford a more liberal across-the-board interpretation of work away from the laboratory.

Patent Policies and Inventions: Under Section 8.2(b) of the Department Patent Regulations, the Assistant Secretary for Health and Scientific Affairs may assign to a "competent organization" title to any invention made in performance of an NIH contract if he finds that the invention will thereby be more adequately and quickly developed. The term "competent organization" has been defined within the Department, without explanation in the regulations, to exclude profit-making organizations. It is recommended that Section 8.2(b) be amended so as to include profit-making organizations. Such a change would enable waiver of invention rights to such organizations with proper safeguards when it is shown that an incentive for further development is necessary and such development will not be funded by the Government. We believe that this change will aid in transferring the results of NIH research to the marketplace and is therefore in the public interest.

C. Evidence of Program Effectiveness

1. What is the evidence that the objectives, discussed above are really served by the program?

   a. summarize findings of studies.

A major evidence of the effectiveness of the intramural programs in meeting their objectives lies in the numbers of scientists who received their initial on-the-job training in intramural laboratories who now play leading roles in both Federal and non-Federal efforts at increasing knowledge. Studies of medical school graduates afforded two to three years training assignments a decade ago show that these are, for the most part, still in research, often as major institute officials at the NIH or in medical schools departments. Of 259 such physicians trained between 1953 and 1958 who were traced in 1963, it was found that 15 percent had remained in government; 70 percent were in universities, and only 15 percent had entered fields where research was not an important part of their endeavor. Of the 259, 13 were full professors at universities; 34 had remained at the NIH and were there in senior capacities. Studies made in individual institutes since then show that even higher percentages now remain in research and form an important part of the national resource. These trained professionals provide the NIH with much of its professional leadership staff and the academic community with uniquely trained teachers and research innovators.

Another measure that can be used in science is the nature of the honors and awards received by staff from civilian societies or associations. In 1963, 31 intramural scientists were so honored. The crowning recognition was the selection of Dr. Marshall Nirenberg as a co-recipient of the 1968 Nobel Prize of Physiology on Medicine, the first such award to a U.S. Government scientist. The election of two members to the National Academy of Sciences, designation of another as one of America's ten outstanding young men by the U.S. Chamber of.Commerice, - election to office in National societies, and other recognitions attests as to the impact of intramural scientists on all elements of society. A list of the more significant non-governmental honors is appended and is in addition to many DHEW awards during the year.

Detailed summaries of research accomplishments and implications of these to medicine and to the public have been reported annually to the Department, the Congress, and the public in the Highlights of Research Progress, and are often amplified in discussions of the hearings before the Subcommittee of the Committee on Appropriations, House of Representatives. Annual summarization of the work of the more than 2,000 professional members of the intramural research

programs also appears in a publication of the NIH limited to administrative use within government. This summary reflects the total program and runs a total of 400 to 500 pages.

b. Indicate evaluations-in-progress.

Continuing evaluations of program accomplishments and effectiveness are made at the Institute level (intramural research directors) and OD level (Associate Director for Direct Research, Deputy Director for Science). The discussion under 2. Evaluation of program performance, is pertinent in this regard.

The NIH encourages its intramural scientists to make their findings readily available by publishing them in the open literature. Reports of research results are submitted for internal Institute and NIH review prior to submission to a scientific journal for publication. An additional important outside review and evaluation process occurs as these reports are considered by the editorial boards of the various professional journals to which they may be sent. The critical appraisal given by disinterested outside scientists constitutes one of the most effective monitoring devices in maintaining the integrity and high quality of all scientific output of which intramural research is a part.

As well as ad hoc groups, a number of constituted PHS Advisory Committees are utilized in review and evaluation of the collaborative programs. On occasion, when major scientific problems or advances warrant, larger meetings of the scientific community are stimulated or organized by intramural groups.

c. List recent non-agency evaluations of programs.

The Wooldridge Committee report of February 1965 entitled "Biomedical Science and Its Administration" presented the results of a White House-initiated review of NIH by an outside group of panel members and consultant teams. The intramural programs of the NIH were evaluated in considerable depth at that time.

It should also be pointed out, however, that the intramural programs are evaluated on a continual basis by the outside consultants who comprise the membership in the Boards of Scientific Counselors of the various Institutes. Their functions are more fully described below.

2. Does the program provide for adequate monitoring and evaluation of performance and do these affect program administration?

Yes, this is provided by several processes:

- Review and decisions on allocation of support of individual investigators by progressively hierarchical levels of personnel management, i.e., section chief, laboratory chief, scientific director of institute who reports to the Institute Director and also to the NIH Associate

Director for Direct Research and Deputy Director for Science.

- Annual report of scientific progress, submitted for all NIH research operations--intramural, collaborative, and extramural. At the project level, they provide each investigator an opportunity to review his accomplishments in relation to his own goals and those of his parent organization. For higher organizational components, the various projects can be fitted into perspective and related to the overall objectives of the branch, laboratory or institute and with the mainstreams of science in their particular field.
- Biomonthly meeting of Institute Scientific Directors, one function of which is to act as a promotion board on all promotions of professional staff.
- Advice to Institute Directors by their Boards of Scientific Counselors.

The Boards of Scientific Counselors of each Institute provide a continuing outside review of the activities of the Laboratories and Clinics in the intramural program. Each, consisting of six members of differing disciplinary and geographic backgrounds, meets twice yearly and reviews a selected segment of the Institutes' intramural research.

In the course of a four-year tenure, each Counselor has the opportunity to review most of an Institute's program. The review includes merit of the program, relevance to the Institute's mission and to the overall efforts in the Nation, relative importance to other intramural Laboratories in the Institute, and advice as to future activities. Members are available as individual consultants to the Director of the Institute and to the Director of the NIH, and are utilized in many advisory capacities. Their reports are a part of the public record.

3. Should the program be consolidated with similar programs elsewhere within or outside of DHEW? If not, why not?

The NIH attempts to carry on a coherent program of intramural research within its defined missions. Owing to the broad and general nature of these scientific endeavors, there are obviously some areas where they impinge upon or overlap the interests and responsibilities of other organization.

For example, a broad group of activities in the bioengineering area, e.g., artificial heart, artificial kidney, and automated clinical laboratories, are supported by several Institutes. As basic research in these areas phases into applied research and development, it begins to become closer to the programs of the National Center for Health Services Research and Development in HSMHA.

The certification of safety and efficacy of biological products by the Division of Biologics Standards obviously bears relationship with the pharmaceutical responsibilities of the Food and Drug Administration of CPEHS.

Research conducted by the National Institute of Allergy and Infectious Diseases (NIAID) and the Division of Biologics Standards (DBS) is very similar and complementary. DBS aims, however, are restricted to those biological product areas for which the Surgeon General has legal responsibility and is oriented to obtain the information needed in monitoring the production and use of such biologicals. Scientists from the two Institutes, as well as those scientists from other Institutes who have shared interests collaborate freely and, as co-authorships of published papers would attest, the vertical lines of Institute designations have little meaning in their scientific activities.

There is also an obvious overlap in the research activities of the National Communicable Disease Center (NCDC), NIAID, and DBS. Again, these activities are complementary and not duplicative since the NCDC is focused on control of communicable disease and the NIAID on development of knowledge in areas where such knowledge does not yet enable control activities. The interchange of information at working levels and frequent collaborations maintain communications in a more

ffective way than would be afforded by management channels. e would recommend no consolidations of groups of such ifferent missions and see no evidence that similar research ıctivities call for consideration of such measures.

There are also obvious similarities of efforts between nany of the Institutes of NIH, NCDC, and those in Department of Defense activities. The Department of Defense adopts, and benefits from, advances occurring under DHEW funded efforts. It also contributes to knowledge on health problems in many specialized ecological situations peculiar to military operations. The interchange of information in the extensive communications network afforded by national and local societies, journals, and research reports is an effective mechanism for ensuring avoidance of needless duplication or continuing research efforts on problems already solved.

Distribution and Recipient Data

1. If State grant program--present tabular listing of distribution by State (dollars and percent). Relate to best measure of State need and evaluate distribution formula.

   Not applicable to intramural research.

2. Who gets how much (percent)

   a. By target group of recipient?
   b. By control and type of institution?
   c. Indicate source and validity of data.

   Not applicable.

3. In what geographical area does the program have its principal impact?

   Benefits deriving from research results in the way of improved health accrue to the entire population in proportion to their accessibility to professional health care.

   a. Urban or rural? Both.

   b. Region of United States? All regions.

   c. Should the target area be broadened or otherwise changed?

   Coverage is already sufficiently comprehensive.

4. a. Is the program defined to serve a particular target population? If so, what population?

   The broad legislative mandates given to the NIH cover the wide spectrum of diseases which are of concern to the entire population including diseases not endemic to the continental U.S.

   b. Does the program in fact serve that group? Yes.

c. Is target population too broad in light of budget restraints?

The social responsibility for improving the health of the population must be met on a continual basis. It does not make good sense for the Federal Government to determine priorities for research activities purely on the basis of target population considerations. The important factors should remain those concerned with scientific opportunity, relative impact of the disease concerned and a variety of other aspects.

d. What groups not served by the program are unable to buy or otherwise obtain similar services elsewhere? For example, the working poor.

Not applicable.

5. a. How does the total federal, state and local effort in this area compare to past efforts in the United States?

The level of direct research for the NIH in past years is shown in Table 2.

b. Current efforts abroad.

Data not available.

Activity	1946	1950	1955	1957	1960	1962	1964	1966	1967 Incl. Mental excl. Envir.	1967 Incl. Envir., excl. Mental	1968
Direct Research	2,100	11,300	22,934	34,142	49,885	69,674	71,138	82,728	90,479	78,647	81,165
Biometry and Epidemiology ‡	-	-	-	-	-	-	-	-	-	-	9,923
Collaborative Studies §	-	-	-	4,668	22,142	35,857	58,060	91,460	113,445	109,726	113,037

*Data represent appropriations, not funds obligated. ‡ New budget category in FY 1968. §Data for years prior to 1962 represent chemotherapy contracts only.

The total "Direct Operations" budget category includes, in addition to the above: Biologics Standards, Professional and Technical Assistance, Training, Review and Approval, Program Direction, International Research, and Computer Research and Technology.

I. Budget Information

A. Report FY 1968-1970 Financial Data (Budget Authority and Outlays).

Data on 1968 Obligations, 1969 Estimated Obligations and the 1970 President Nixon Budget are shown in Table 3 for the NIH. The underlined categories pertinent to the NIH "direct operations" are "other direct operations," "contracts," and a portion of "research supporting activities."

B. Report history of Division submission, bureau recommendation, agency budget, Department budget, and Congressional action for each year.

The breakdown for these items is given in Table 4 and shows them listed as Laboratory and Clinical Research, Collaborative Research and Development, and Biometry, Epidemiology and Field Studies.

C. For FY 1970, indicate what part of budget is

1. Uncontrollable (why?)

2. committed (how?)

3. discretionary.

Table 5 lists the committed, discretionary and total figures for the 1970 President Nixon budget.

TABLE 3
INCREASING KNOWLEDGE

NIH Obligations, by Program
1968 - 1970
(in thousands of dollars)

	1968 Obligations	1969 Estimated Obligations	1970 President Nixon Budget
L, INSTITUTES AND RESEARCH DIVISIONS	1,081,430	1,097,508	1,069,776
BAIC RESEARCH PROGRAMS	414,334	410,329	410,756
GRANTS	354,902	346,148	345,889
CONTRACTS	13,335	13,170	13,755
OTHER DIRECT OPERATIONS	46,097	51,011	51,112
GEERAL RESEARCH SUPPORT GRANTS	54,217	52,945	52,945
SPCIAL EMPHASIS RESEARCH PROGRAMS	325,174	346,018	356,831
GRANTS	207,143	216,576	226,437
CONTRACTS	90,145	100,101	100,547
OTHER DIRECT OPERATIONS	27,886	29,341	29,847
TRINING	187,524	197,988	179,194
TRAINING GRANTS	134,776	141,240	132,188
FELLOWSHIPS	52,192	56,062	46,412
HELTH RESEARCH FACILITIES	38,368	20,640	
REEARCH SUPPORTING ACTIVITIES	61,813	69,588	70,050
SALARIES AND EXPENSES	6,138	6,993	7,093
MANAGEMENT FUND	37,018	40,680	41,092
THER	18,657	21,915	21,865

National Institutes of Health
(in thousands of dollars)

	NIH Preliminary to DHEW	DHEW Estimates to BOB	President's Budget	President Nixon Budget	Appropriation	Apportionment	Obligation
Laboratory and Clinical Research							
1968	93,353	86,538	81,691		81,165	80,960	79,356
1969	98,316	96,872	87,478		86,648	87,910	
1970	95,270	93,055	89,161	87,689			
Collaborative Research and Development							
1968	120,124	124,146	113,037		113,037	116,799	111,111
1969	139,113	136,562	126,490		124,796	120,598	
1970	146,665	132,019	127,400	120,916			
Biometry, Epidemiology and Field Studies							
1968	9,712	10,321	9,923		9,923	9,567	9,219
1969	11,722	11,441	9,790		9,790		
1970	10,662	10,746	9,958	9,772			

National Institutes of Health

II.C. For FY 1970 indicate what part of budget is uncontrollable, committed and discretionary.

	1969 Estimated Obligations	Difference between 1969 Estimated Obligations and 1970 President Nixon Budget	1970 President Nixon Budget		
			Committed	Discretionary	Total
Laboratory and clinical research......	$85,554	$+2,135	$85,965	$1,994	$87,689
Collaborative research and development......................	$121,306	$-390	$120,916	--	$120,916
Biometry, epidemiology and field studies.........................	$9,550	$+222	$9,572	$200	$9,772

Explanation:

Committed - The portion of the 1970 Nixon Budget shown as "committed" represents the estimated 1969 level of obligations plus built-in increases, such as annualization of positions new in 1969 and pay raises, less program decreases.

Discretionary - The portion of the 1970 Nixon Budget shown as "discretionary" represents the 1970 program increases over the estimated 1969 level of obligations.

Legislative Changes (recent).
Report recent changes and how they affect items above.

P.L. 90-489, dated August 16, 1968, added a Section 451 to the Public Health Service Act, authorizing the establishment of a National Eye Institute within the National Institutes of Health. In a related action, P.L. 90-639 changed the name of the National Institute of Neurological Diseases and Blindness to the National Institute of Neurological Diseases and Stroke. The immediate impact of these legislative changes has been quite limited. This is because of the problems of bringing into being a new Institute at a time when overall expenditures and personnel ceilings for the Department and the NIH are being reduced, and there are problems of availability of space (for example, for clinical and laboratory research). However, at some time in the reasonably near future, the research activities of the former NINDB--in the area of vision--are expected to become the responsibility of the new National Eye Institute.

FORWARD PLAN

A. National Goals, Needs and Program Objectives.

Show the total need (non-dollar) for the program to fully meet the national goals. State the desired program objectives that could be realistically achieved if dollar constraints were not considered. Indicate the non-dollar constraints, for example knowledge, manpower, building time, etc., that would inhibit meeting the goal immediately.

It is important to recognize that, as a national asset or resource, the NIH intramural research program is assuming a role of growing importance. The current social pressures being exerted on medical schools and universities to become more involved in provision of services, especially at the community level, are altering the character of those institutions. Amidst the current changing social scene, it is essential that the NIH maintain and foster a "system" of in-house research excellence to provide a prototype for the type of environment envisioned as of particular need in providing knowledge for bettering the future health of this Nation.

The newer NIH programs reveal a trend toward increasing degrees of program management, frequently, though not exclusively, identifiable with collaborative contract-supported activities. The nature of scientific research itself is changing--becoming of greater complexity and precision and associated with higher costs. Inevitably, there is more dependence on special instrumentation and abilities with a greater degree of interdisciplinary effort and requirement for greater coordination of data and resources. Specific areas offering opportunities for concerted attack by "big science" investment must be highlighted and adequately funded on a separate basis.

The Current Situation:

The position, status, and capabilities of the intramural research programs are being eroded by two significant factors, first, the continuing and steady reduction in personnel levels imposed by the Revenue and Expenditure Control Act of July 1968, and second, the indefinite postponement of on-campus construction projects.

In order to maintain a viable organization, there must, at the very least, be relief from continued losses in personnel. It would be far more advisable to permit a gradual increase in budgeted positions to allow for limited expansion of effort into areas of special priority or recognized need. Similarly, construction of the buildings now in the planning stage must be started as rapidly as possible. Further undue delays can only impose a detrimental effect on the impetus of the intramural effort.

Although dollar constraints are of importance insofar as they determine the rate at which resources can be marshalled in support of given program areas, it must be recognized that other factors actually govern the rate of progress against disease. These include:

-- the somewhat unpredictable nature of research discovery and scientific breakthrough, dependent nevertheless on such things as the technological "state of the art" and available base of scientific knowledge upon which advances must be built.

-- the availability of well-trained and dedicated manpower committed to the research endeavor.

-- the time lag involved in implementing programs in special interest areas initiated by technical or conceptual advances, requiring planning considerations, probable reallocation of resources, and possible construction delays. In the latter regard, it might be noted that as much as a decade or more has elapsed between planning of a building at NIH and its occupancy. During such periods, construction costs increase greatly, adding to the difficulties in overall planning.

As a general observation, it should be stated that the primary limitations on the size of the NIH intramural program at Bethesda, Maryland, are the constraints of space. This in turn obviously places constraints on the total numbers of personnel which can be profitably utilized. A "reasonable" growth of the intramural system is envisioned, but no major building or expansion program can be accommodated within the present confines of the Bethesda reservation. The only construction to be started this year will be a multilevel parking facility for buildings 36 and 37 on the reservation, and a primate facility and NIMH laboratories at the animal center in Poolesville, Maryland. Renovation of the Stone House (for the Fogarty International Center) of Building 6, and of other buildings will also be undertaken.

For FY 1971, the following planning or construction funds are needed.

1. Planning funds are sought for

    a. A joint NIAID-NINDS virology building.

    b. The NEIHS complex of facilities at Research Triangle Park, North Carolina, which will eventually contain the activities being housed initially in leased space.

2. Construction funds should be appropriated for:

    a. NICHD research laboratory building.

    b. NIMH Child research center.

    c. Fogarty International Center.

    d. Small animal building and associated utilities at the Poolesville Center (phase 2).

    e. Combined Service Facility (Garage-Warehouse-Firehouse).

    f. Multilevel Parking for Building 31.

B. Program Requirements.

1. Show for each year (FY 1971-1975 the estimated program output which would be necessary to achieve the realistic objectives set forth in A. above and the percentage of the need met by this output.

In projecting growth of direct research at a realistic level, it should be recognized that certain high priority areas deserve special attention--areas not unique to intramural interests but relating in general to the opportunities and needs of the biomedical sciences in their quest for improving the quality of life as well as lengthening its span. They comprise a part of the leading edge of current research, whether intramural or extramural; the following are representative of such areas:

a. Search for a surface compatible with blood which will not induce clotting. Successful research in this regard would greatly advance the field of artificial organ replacement.

b. Studies of physiological membranes and how they work--having important implications for understanding the function of the kidneys, brain, nerve and other organs and of the mode of action of hormones such as insulin, and of neurohormonal agents such as norepinephrine. This would contribute not only to our understanding of disease processes as such, but also to our knowledge of important behavioral mechanisms.

c. Further research on hormone action and the synthesis, in therapeutically sufficient quantities, of important human hormones such as growth hormone.

d. The virus field deserves much more attention, ranging from studies of the common cold (which causes the major loss in man hours in the working force) to the possible causative role of viruses in human cancer. Investigations on agents to combat viruses must be carried forward on a variety of fronts, e.g., vaccines (especially against childhood diseases), interferon, chemical agents, etc.

e. Environmental health: The quality of the environment obviously influences the quality of life. Of special need are studies on the hazards of smoking, mycotoxins and other natural products in water and food, inhaled materials such as asbestos, trace elements, and pesticides. The establishment of adequate standards must be based on sound scientific data.

f. Child development and aging: Human development represents an extremely complex but highly important interaction between biological processes and a wide range of physical, social, and interpersonal influences. The vigor of the later years is limited by little understood biological changes. Fundamental research must be pursued on the cellular and molecular alterations in bodily processes, and, in addition, on the behavioral, social and environmental aspects of child development and aging.

Important fiscal considerations must also be kept in mind in planning ahead.

-- The inflation in costs of living and wages is causing an increase in personnel costs of 5 percent or more each year.

-- Increases in costs of doing research owing to greater dependence upon advanced equipment, instrumentation, and techniques (the so-called "sophistication factor") is producing an equivalent increase in costs.

Thus, simply to maintain a given level of effort requires budgetary growth at the rate of 10-11 percent per year. Anything less than this amounts to a decline in "real effort." It is evident that we are now experiencing such a decline.

2. Layout for the period (FY 1971-1975) an alternative program level which would maintain program output (or coverage) at a constant FY 1970 level by taking into account growth in population and other specified relevant factors. Indicate what revisions in program objectives would be necessary and the percentage of the total need that would be met if this alternative were chosen.

As stated above, program output or level of research effort can be maintained only by an annual increase in dollars of 10-11 percent. It is almost impossible, however, to gauge the absolute effects of given dollar inputs in terms of quantitative research output measured in specific accomplishments, etc. The nature of research and scientific discovery defies such simplistic treatment.

Total need is similarly difficult to define. At one extreme, our lack of understanding of many serious diseases might warrant infinitely greater attention than can now be devoted to the particular problem, but from the realistic point of view, limitations in trained manpower and in the available store of knowledge and technology place practical

constraints upon the research system. To this we are sensitive.

Should the alternative level (B.2) be imposed on the NIH direct research activities, there would be no change in overall program objectives, but the ability to meet these objectives and to respond to special research opportunities would definitely be curtailed. While an attempt would be made to maintain as balanced an overall program as possible, there would be an inevitable shrinking of contributions from the intramural programs and a decline in their importance over the coming years.

C. Budget Projection--Dollar Requirements to Meet the Above Needs at Both the Realistic Level (B.1.) and the Alternative Level (B.2).

1. Using present administrative and legislative structure.
2. Indicate alternative methods for meeting needs, cost data for each alternative and an indication of preferred alternative.

In order to recover the impetus provided by the rapid growth of NIH up to the mid-sixties and to move ahead confidently into a new era of sustained excellence, it is vital that sufficient resources be made available for this purpose. With this intention, the basis for a realistic plan (B.1) is summarized in Tables 6-8. The overall growth rate for the "other direct operations" (mostly intramural research) of 18.7 percent represents a reasonable growth, taking into account the cost factors discussed above, and the considerations regarding the availability of space for expansion mentioned earlier. A more vigorous rate of growth (22.8 percent) for the research contract programs is proposed. This would permit taking rapid advantage of major opportunities in special emphasis areas by collaborative activities.

It must be recognized that unpredictable external factors could modify these budget figures. Significant breakthroughs in fields of science may suddenly present new opportunities which must be quickly exploited. Various pressures may result in the establishment of new Institutes within the NIH organizational structure.

Dollar projections for the alternative level (B.2) are given in Tables 9-11. The annual growth rates of contracts and other direct research are 8.0 and 8.9 percent respectively.

The realistic plan for NIMH is given in Table 12 and the alternative plan in Table 13. Costs of the Office of Communications are included under Labs and Clinics. The Biometrics program for NIMH was projected using the same rates of increase under both plans.

Funds for intramural construction, major renovation or planning of facilities are listed under the separate budget item "Buildings and Facilities" in Tables 6-13. Under the Realistic Plan, some of the projects originally intended for 1970 or earlier have been placed into the 1971 budget estimate. Other planning and construction projects extend into 1972 with minor inclusions in 1973 and 1974. It is evident that for the later years of the five-year plan, there will be a lessening in the extent of construction of intramural facilities.

The alternative plan in Tables 9-11 presents a "holding operation" in which minimal construction will take place. It is essential, however, that certain necessary repairs and improvements be allowed in the budget.

INCREASING KNOWLEDGE
NIH, NLM Program and Financial Plan
Realistic Plan
1968 - 1975
(in millions of dollars)

	1968	1969	1970	1971	1972	1973	1974	1975
National Library of Medicine	17	20	20	68	77	86	94*	98
Grants	7	8	6	22	25	28	30	31
Direct Operations	10	12	14	21	27	33	38	42
Construction Grants				25	25	25	25	25
Institutes and Research Divisions	1,088	1,108*	1,080*	1,568	1,828	2,108	2,420	2,782
Research	800	819	831	1,042	1,246	1,450	1,688	1,967
Research Grants	562	563	572	685	815	933	1,074	1,239
General Research Support Grants**	60	61	61	100	125	155	182	210
Research Contracts	103	113	115	150	179	217	264	322
Other Direct Research Operations	75	82	83	107	127	145	168	196
Training and Fellowships	187	198	179	326	363	408	456	508
Construction (HRFC)	38	21	-	120	127	141	148	160
Research Supporting Activities	63	72	72	80	92	109	128	147
Buildings and Facilities	4	15	4	28	45	11	3	1

* Discrepancy due to rounding
** Includes NIMH contribution to GRSG

1968 - 1975
(1969 = 100)

	1968	1969	1970	1971	1972	1973	1974	1975
National Library of Medicine	85.0	100.0	100.0	340.0	385.0	430.0	470.0	490.0
Grants	87.5	100.0	75.0	275.0	312.5	350.0	375.0	387.5
Direct Operations	83.3	100.0	116.7	175.0	225.0	275.0	316.7	350.0
Construction Grants				*	*	*	*	*
Institutes and Research Divisions	98.2	100.0	97.5	141.5	165.0	190.2	218.4	251.1
Research	97.6	100.0	101.5	127.0	151.8	176.7	205.7	239.6
Research Grants	99.8	100.0	101.6	121.7	144.8	165.7	190.8	220.1
General Research Support Grants**	98.4	100.0	100.0	163.9	204.9	254.1	298.4	344.3
Research Contracts	91.2	100.0	101.8	132.7	158.4	192.0	233.6	285.0
Other Direct Research Operations	91.5	100.0	101.2	130.5	154.9	176.8	204.8	239.0
Training and Fellowships	94.4	100.0	90.4	164.6	183.3	206.1	230.3	256.6
Construction (HRFC)	181.0	100.0	--	571.4	604.8	671.4	704.8	761.9
Research Supporting Activities	87.5	100.0	100.0	111.1	127.8	151.4	177.8	204.2
Buildings and Facilities	26.6	100.0	26.6	186.7	300.0	73.3	20.0	0.1

* Zero dollars in base year
**Includes NIMH contribution to GRSG

Realistic Plan
1968 - 1975
Average Annual Increase

	1970 to 1971	1970 to 1975	1971 to 1975
National Library of Medicine	240.0	37.4	9.6
Grants	266.7	38.9	8.9
Direct Operations	50.0	24.6	18.9
Construction Grants	*	*	0.0
Institutes and Research Divisions	45.2	20.8	15.4
Research	25.4	18.8	17.2
Research Grants	19.8	16.7	16.0
General Research Support Grants**	63.9	28.0	20.4
Research Contracts	30.4	22.8	21.0
Other Direct Operations	28.9	18.7	16.3
Training and Fellowships	82.1	23.2	11.7
Construction (HRFC)	*	*	7.4
Research Supporting Activities	11.1	15.3	16.4
Buildings and Facilities	600.0	-15.0	-24.1

*Zero dollars in 1970
**Includes NIMH contribution to GRSG

1968 - 1975
(in millions of dollars)

	1968	1969	1970	1971	1972	1973	1974	1975
National Library of Medicine	17	20	20	22	24	26*	28	30
Grants	7	8	6	7	8	8	9	10
Direct Operations	10	12	14	15	16	17	19	20
Institutes and Research Divisions	1,088	1,108*	1,080*	1,219	1,315	1,418	1,528	1,649
Research	800	819	831	908	974	1,044	1,119	1,199
Research Grants	562	563	572	612	655	701	750	803
General Research Support Grants**	60	61	61	65	70	75	80	86
Research Contracts	103	113	115	124	134	145	157	169
Other Direct Research Operations	75	82	83	89	99	107	117	127
Training and Fellowships	187	198	179	209	231	257	284	314
Construction (HRFC)	38	21	-	44	47	50	52	58
Research Supporting Activities	63	72	72	76	79	83	88	92
Buildings and Facilities	4	15	4	7	2	1	1	1

* Discrepancies due to rounding

**Includes NIMH contribution to GRSG

1968 - 1975
(1969 = 100)

	1968	1969	1970	1971	1972	1973	1974	1975
National Library of Medicine	85.0	100.0	100.0	110.0	120.0	130.0	140.0	150.0
Grants	87.5	100.0	75.0	87.5	100.0	100.0	112.5	125.0
Direct Operations	83.3	100.0	116.7	125.0	133.3	141.7	158.3	166.7
Institutes and Research Divisions	98.0	100.0	97.5	110.0	118.7	128.0	137.9	148.8
Research	97.7	100.0	101.5	110.9	118.9	127.5	136.3	146.4
Research Grants	99.8	100.0	101.6	108.7	116.3	124.5	133.2	142.6
General Research Support Grants**	98.4	100.0	100.0	106.6	114.8	123.0	131.1	141.0
Research Contracts	91.2	100.0	101.8	109.7	118.6	128.3	138.9	149.6
Other Direct Research Operations	91.5	100.0	101.2	108.5	120.7	130.5	142.7	154.9
Training and Fellowships	94.4	100.0	90.4	105.6	116.7	129.8	143.4	158.6
Construction (HRFC)	181.0	100.0	*	209.5	223.8	238.1	247.6	276.2
Research Supporting Activities	87.5	100.0	100.0	105.5	109.7	115.3	122.2	127.8
Buildings and Facilities	26.6	100.0	26.6	46.7	13.3	7.0	7.0	7.0

* Zero dollars in 1970

**Includes NIMH contribution to GRSG

NIH, NLM Program and Financial Plan
Alternative Plan
1968 - 1975
Average Annual Increase

	1970 to 1971	1970 to 1975	1971 to 1975
National Library of Medicine	10.0	8.4	8.1
Grants	16.7	10.8	9.3
Direct Operations	7.1	7.4	7.4
Institutes and Research Divisions	12.9	8.8	7.8
Research	9.3	7.6	7.2
Research Grants	7.0	7.0	7.0
General Research Support Grants**	6.6	7.1	7.2
Research Contracts	7.8	8.0	8.0
Other Direct Research Operations	7.2	8.9	9.3
Training and Fellowships	16.8	11.9	10.7
Construction (HRFC)	*	*	7.1
Research Supporting Activities	5.5	5.0	4.9
Buildings and Facilities	75.0	-15.0	-21.4

* Zero dollars in 1970
**Includes NIMH contribution to GRSG

(in millions of dollars)

	1968	1969	1970	1971	1972	1973	1974	1975
INCREASING KNOWLEDGE, NIH								
National Library of Medicine	17	20	20	68	77	86	94	98
Grants	7*	8*	4*	22	25	28	31	31
Direct Operations	10	12	14	21	27	33	38	42
Construction Grants				25	25	25	25	25
Institutes and Research Divisions	1,083	1,102	1,072**	1,557	1,815	2,094	2,399	2,758
Research	795	811	823	1,051	1,256	1,463	1,699	1,979
Research Grants	562	563	572	685	815	933	1,074	1,239
General Research Support Grants	55	53	53	89	112	141	161	186
Research Contracts	103	113	115	150	179	217	264	322
Other Direct Operations	75	82	83	107	127	145	168	196
Training & Fellowships	187	198	179	326	363	408	456	508
Construction (HRFC)	38	21	-	120	127	141	148	160
Research Supporting Activities	63	72	72	80	92	109	128	147
National Institute of Mental Health								
Research Grants	36	36	37	43	50	59	69	80
Scientific Evaluation	--	--	--	--	--	--	1	1
Research Contracts	1	1	1	3	4	6	7	9
Personnel & other objects	1	2	2	3	3	4	4	5
General research support	5	8	8	11	13	14	21	24
Labs and clinics				26	30	35	40	47
Biometrics				1	1	1	1	1
Training and fellowships								
Buildings and Facilities	4	15	4	28	45	11	3	1

* Includes Library Construction Grants

** Discrepancies due to rounding

(In millions of dollars)

	1968	1969	1970	1971	1972	1973	1974	1975
Increasing Knowledge, NIH								
National Library of Medicine	17	19	20	22	24	25	28	30
Grants	7*	7*	6*	7	8	8	9	10
Direct Operations	10	12	14	15	16	17	19	20
Construction Grants								
Institutes and Research Divisions	1,083	1,102	1,072**	1,209	1,304	1,404	1,513	1,633
Research	795	811	823	898	963	1,030	1,104	1,183
Research Grants	562	563	572	612	655	701	750	803
General Research Support Grants	55	53	53	55	59	61	65	70
Research Contracts	103	113	115	124	134	145	157	169
Other Direct Research Operations	75	82	83	89	99	107	117	127
Training and Fellowships	187	198	179	209	231	257	284	314
Construction (HRFC)	38	21	--	44	47	50	52	58
Research Supporting Activities	63	72	72	76	79	83	88	92
National Institute of Mental Health								
Research Grants	36	36	37	40	43	46	49	53
Scientific Evaluation	--	--	--	--	--	--	1	1
Research Contracts	1	1	1	1	1	1	1	1
Personnel and Other Objects	1	2	2	3	3	3	3	4
General Research Support	5	8	8	10	11	14	15	16
Labs and Clinics				26	30	32	33	34
Biometrics				1	1	1	1	1
Training and Fellowships								
Buildings and Facilities	4	15	4	7	12	1	1	1

* Includes Library Construction Grants.
** Discrepancies due to rounding.

D. Legislative requirements for the preferred Forward Plan (Part C).

1. Extension of existing legislation needed--

   The research contract authority in the Public Health Service Act (Section 301(h)) will expire on June 30, 1971, unless it is extended some time before then.

2. Extension needed with amendments--none.

3. New legislation needed--none.

4. Administrative actions needed--implementation of the intramural research activities of the new National Eye Institute through assignment of space, transfer of pertinent activities from NINDS, etc.

HONORS AND AWARDS IN 1968 TO NIH STAFF MEMBERS

RTER, DR. FREDERIC C., Chief, Clinical Endocrinology Branch, NHI
Presented the 1st Eli Lilly Lecture at the VII Annual Meeting of the Mexican Society for Nutrition and Endocrinology

RINER, DR. ROBERT W., Director, Intramural Research, NHI
Elected to the National Academy of Sciences

NWALD, DR. EUGENE, Clinical Director, NHI
Modern Medicine Award

OIE, DR. BERNARD B., Chief, Laboratory of Chemical Pharmacology, NHI
Honorary Doctor of Medicine degree by the Karolinska Institute, Stockholm

ON, JOSEPH M., Assistant Chief, Collaborative Research Office, NIDR
Career Education Award from the National Institute of Public Affairs

MAROW, DR. ABRAHAM, Research Planning Officer, Program Analysis and Formulation Branch, NCI
Named Vice-president, American Association for Cancer Research

OI, DR. KENNETH, Senior Research Biophysicist, NINDS
1967 National Medal of Science at White House Ceremony

HIRO, DR. GIOVANNI, Head, Neuroradiology Section, NINDS
1st prize and $1,000 for film, "Isotope Cisterno--and Ventriculography" from the Society of Nuclear Medicine

Named President-elect, American Society of Neuroradiology

DY, DR. NATHAN B., Retired - Active Consultant to the Laboratory of Chemistry, NIAMD
Hillebrand Prize by the American Chemical Society (shared with Dr. E. L. May)

RLEY, DR. ELWIN E., Senior Investigator, Surgery Branch, NCI
1st prize of $500 in the American Urological Association's annual essay contest for laboratory research (shared with Dr. D. F. Paulson)

RDERICKSON, DR. DONALD S., Director, NHI
American College of Cardiology's Convocation Gold Medal

Third International Medical Research Award by the James F. Mitchell Foundation for Medical Research and Education

RENHOUSE, DR. SAMUEL W., Chief, Epidemiology and Biometry Branch, NICHD
Named President-elect, Biometric Society, Eastern North American Region

AEL, DR. KARL, Retired - NIAID
Elected to the National Academy of Sciences

ETZ, DR. ROY, Chief, Reproduction Research Branch, NICHD
The Claude Bernard Visiting Professorship Award and Medal from the University of Montreal

NER, DR. ROBERT J., Chief, Laboratory of Viral Diseases, NIAID
Presented the Howard Taylor Ricketts Lecture at the University of Chicago

IAN, DR. BARRY D., Laboratory of Immunology, NIAID
Joseph A. Capps Award from the Institute of Medicine of Chicago

IN, DR. DAVID, Laboratory of Biochemical Pharmacology, NIAMD
Named "Distinguished Young Scientist" by the Maryland Academy of Sciences

', DR. EVERETTE L., Chief, Laboratory of Chemistry, NIAMD
Hillebrand Prize by the American Chemical Society (shared with Dr.N.B.Eddy)

.VILLE, DR. ROBERT S., Assistant Chief, Research Grants Branch, NIGMS
Named President-elect, American Association of Clinical Chemists

.LER, DR. CARL, Research Veterinarian, DBS
Named President-elect, National Capital Area Branch of the American Association of Laboratory Animal Science

IROW, DR. ANDREW G., Chief, Clinic of Surgery, NHI
Named President, North American Chapter of the International Cardiovascular Society

IENBERG, DR. MARSHALL W., Chief, Laboratory of Biochemical Genetics, NHI
Dickinson College's Priestley Memorial Award

Franklin Award from the University of Pennsylvania

The Louisa Gross Horwitz Prize from Columbia University

Nobel Prize

IKMAN, DR. PAUL D., Assistant Chief, Laboratory of Viral Immunology, DBS
TOYM Award - One of America's Ten Outstanding Young Men by the U.S. Junior Chamber of Commerce

JLSON, DR. DAVID F., Clinical Associate, Surgery Branch, NCI
1st prize in the American Urological Association's annual essay contest for laboratory research (shared with Dr. E. E. Fraley)

JSCHER, DR. FRANK J., Associate Scientific Director for Viral Oncology, NCI
Arthur S. Flemming Award

SEN, DR. LEON, Head, Pacific Research Section, NIAID
The Bailey K. Ashford Award by the American Society of Tropical Medicine and Hygiene

HIMKE, DR. ROBERT T., Former scientist from the Laboratory of Biochemical Pharmacology, NIAMD
American Chemical Society Award

EGMILLER, DR. J. EDWIN, Chief of Section on Human Biochemical Genetics, NIAMD
Gairdner Foundation Annual Achievement Award

ALKINGTON, ROBERT, NLM
Career Education Award by the National Institute of Public Affairs

EGNER, DR. GLEN E., Children's Diagnostic and Study Branch, NICHD
Selected as a White House Fellow

HANG-PENG, DR. JACQUELINE, Senior Investigator, Clinical Trials Area, NCI
Woman of the Year Award in Medicine by the Lions International and the China Daily newspaper, Taipei, Taiwan

REPORT ON

PROGRAM DESIGNATED BY THE
ASSISTANT SECRETARY FOR PLANNING AND EVALUATION

"TRAINING AND FELLOWSHIPS"

For the Health Team Assigned
Responsibility for the Objective Area:
Increasing Knowledge

PROGRAM: Training and Fellowships

SUMMARY

Goals - The NIH responsibility is to maintain in training a sufficient number of pre- and post-doctoral trainees in the health sciences to insure an adequate supply in the late 1970's and 1980's of (1) well-qualified health research scientists to meet the needs of society, and (2) biomedical faculty for the health professional schools and other academic institutions all of which are expected to increase their enrollments substantially during the 1970's.

Objectives

(a) Realistic Level

Fiscal Year	No. of Trainees Receiving NIH Support (thousands)
1971	31.6
1972	33.2
1973	35.1
1974	37.0
1975	38.9

(b) Alternative Levels

(1) Assuming budget at FY 1970 level throughout period.

Fiscal Year	No. of Trainees Receiving NIH Support
1971	17.3
1972	16.5
1973	15.7
1974	15.0
1975	14.2

(2) Assuming continued support of same number of trainees supported as will be provided support under the President's FY 1970 budget; namely, 17,300.

(3) Assuming support of the same ratio of pre-doctoral trainees in the health sciences to total graduate enrollment in each of the years of the FY 1971-75 period as obtained in FY 1970.

(3) continued.

Fiscal Year	No. of Trainees Receiving NIH Support
1971	19.9
1972	20.9
1973	22.1
1974	23.3
1975	24.5

Approximation of Objectives to Needs

A. Realistic Level - will meet needs.

B. Alternative Levels:

(1) Will meet about 45% of needs.

(2) Will meet about 50% of needs.

(3) Will meet 63% of needs.

Dollars

A. Realistic Level

Fiscal Years	Budget Needed (millions)
1971	$ 332.9
1972	367.3
1973	408.3
1974	452.0
1975	498.9

B. Alternate Levels

(1) $179 for each year

		(millions)
(2)	FY 1971	$ 179.0
	FY 1972	188.4
	FY 1973	197.9
	FY 1974	207.8
	FY 1975	218.2
(3)	FY 1971	209.2
	FY 1972	230.9
	FY 1973	256.7
	FY 1974	284.1
	FY 1975	313.6

PROGRAM: Training and Fellowships

SUMMARY

I. Goals - The NIH responsibility is to maintain in training a sufficient number of pre- and post-doctoral trainees in the health sciences to insure an adequate supply in the late 1970's and 1980's of (1) well-qualified health research scientists to meet the needs of society, and (2) biomedical faculty for the health professional schools and other academic institutions all of which are expected to increase their enrollments substantially during the 1970's.

II. Objectives

(a) Realistic Level

Fiscal Year	No. of Trainees Receiving NIH Support (thousands)
1971	31.6
1972	33.2
1973	35.1
1974	37.0
1975	38.9

(b) Alternative Levels

(1) Assuming budget at FY 1970 level throughout period.

Fiscal Year	No. of Trainees Receiving NIH Support
1971	17.3
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1974	15.0
1975	14.2

(2) Assuming continued support of same number of trainees supported as will be provided support under the President's FY 1970 budget; namely, 17,300.

(3) Assuming support of the same ratio of pre-doctoral trainees in the health sciences to total graduate enrollment in each of the years of the FY 1971-75 period as obtained in FY 1970.

NIH Training and Fellowship Programs

ogram Background

Program Objectives

1. NIH is the primary instrument of the Federal Government (and of the Nation) for the support of training of manpower for research and teaching in all fields related to health, with the unique responsibility for insuring an adequate supply of; (1) well qualified health researchers to meet the needs of society, and (2) biomedical faculty for universities, medical schools, and other health professional schools.

NIH manpower training programs:

a. Increase the number of scientists capable of creative scientific research and of graduate teaching in the medical sciences, for both necessary expansion of research and teaching, and for providing the trained personnel to offset yearly losses due to death, retirement and shifts to less demanding or more financially rewarding occupations.

b. Strengthen and upgrade the quality of graduate biomedical training, generally, and particularly, the training of biomedical research scientists and faculty for biomedical institutions. The benefits from the general improvement in the graduate training, to which these programs contribute, are not limited to those who ultimately enter research and teaching, but affect all students in the biomedical sciences at the graduate level and all medical professionals (physicians, dentists, bacteriologists, pathologists, etc.)

2. Legislative authorization

The legislative and administrative acts which have brought NIH and its programs to their current position of prominence have been marked by a remarkable degree of farsightedness and vigorous pursuit of intention. The Congress recognized that a significant investment in the training of biomedical manpower is essential to the success of efforts to improve the health of our citizens.

The broad nature of the language provides a high degree of flexibility in the initiation and implementation of specific manpower programs.

Emphasis was placed on the utilization of a wide variety of institutional settings in order to train the necessary manpower.

In accordance with Section 301 of the Public Health Service Act, the Surgeon General is authorized to "........encourage, cooperate with, and render assistance to other appropriate public authorities, scientific institutions, and scientists in the conduct of, and promote the coordination of, research, investigations, experiments, demonstrations, and studies relating to the cause, diagnosis, treatment, control, and prevention of diseases and impairments of man ....."

In carrying out the foregoing, the Surgeon General (or Secretary) is authorized to "(c) Establish and maintain research fellowships in the Service with such stipends and allowances, including traveling and subsistence expenses, as he may deem necessary to produce the assistance of the most brilliant and promising research fellows from the United States and abroad; (d) make grants-in-aid to universities, hospitals, laboratories, and other public or private institutions, and to individuals for such research or research training projects as are recommended......"

In Section 433(a) of this Act, the Surgeon General (or Secretary) is authorized to "provide training and instruction and establish and maintain traineeships and fellowships, in such institute and elsewhere, in matters relating to the diagnosis, prevention, and treatment of such disease or diseases... and, in addition, provide for such fellowships through grants to public and other nonprofit institutions.

3. Output measures

Currently, (1969) NIH training and fellowship programs provide stipend support for 19,400 students at the graduate and post-doctoral levels; (some 4,000 additional students are provided financial support for short periods in the academic year under the general research support grant program).

The numbers supported through the training and fellowship programs have not changed materially in the 1966 to 1969 period; funds available for support keeping up only with the cost of training. For fiscal 1970, however, the numbers of students receiving stipends are estimated to decline to 18,700.

In the following table, the numbers of students shown are those receiving stipends in the given fiscal year; the funds shown are those obligated in the year. It should be noted that fellowships are funded from funds obligated in the year of student support, while training grants are forward financed, that is, funds to support the training of students in a given year (through training grants) are funded from obligations of the previous year.

Fiscal years	Obligations for training and fellowships (millions of dollars)	Number of students receiving stipend support (thousands)
1970 est.	$179.0	18.7
1969 est.	197.7	19.4
1968	187.1	20.0
1967	182.5	21.2
1966	168.7	20.1

(additional detail is provided in Appendix tables 1 and 2)

·. Relations with PPB program structure

The training and fellowship program objectives are encompassed in the Increasing Knowledge component of the Program Planning Budget framework.

5. Not applicable

rogram Operations

1. What is the basic rationale for Federal Government action in this area?

The basic rationale for the Federal Government's role is the nature, national importance, and magnitude of the requirements to assure a continuing supply of manpower trained in basic and specialty areas. These areas have changed rapidly in the past and they will evolve and develop in a dynamic fashion to meet the scientific challenges and opportunities of the future.

2. What is the involvement of state and local government in this area?
3. What is the present role of nongovernmental participation in this area?

Private and public institutions of higher education, hospitals (voluntary and state and local owned) community health agencies are involved in the training process, (see Section D). Institutions and agencies do contribute also in dollar terms to the Nation's training programs to the extent that they are able. Estimates of the total magnitude of this dollar support are not available.

Moreover, the continuing advice and guidance of the scientific community, of the administrators associated with training institutions, and of lay leaders are essential to NIH in the administration of the training programs. These people serve on advisory councils, review groups, and selection panels and thus play a key participative role.

4. Not applicable.
5. Not applicable.

6. When, if ever, will Federal Government participation in this area be phased out?

   As already indicated, the national importance and magnitude of the program necessary to assure adequately trained manpower for research and academic medicine require a national overview, provided by the Federal Government, with the assistance and participation of representatives of the nonfederal sector.

7. a. To what extent is the program attempting to provide models and experiments for new ways to attain national goals?
   b. To what extent do obsolete rigidities hinder progress in the program area?

   Aspects of the NIH training programs include the support of new ways to meet national goals. For instance, change and improvement in medical school curriculum having national implications may evolve from the program being supported at such schools as Duke University and Stanford University. Moreover, program flexibility has made possible the emergence of departments, within schools of medicine and graduate schools, in such fields as genetics, biochemistry, microbiology; the strengthening of training in certain critical clinical specialty areas, such as therapeutic radiology, anesthesiology, neurosciences, and the fostering of interdisciplinary training, where the life sciences, engineering, mathematics, and the physical sciences all contribute to and are necessary for the solution of health problems.

   The obstacles for further progress are not the presence of rigidities in program operations.

Evidence of Program Effectiveness

1. What is the evidence that the objectives, discussed above, are really served by the program?

NIH training programs were and are designed to achieve specific but interdependent objectives -- increasing the supply of personnel trained for careers in research and academic medicine, and enhancing the quality of the training through monitoring of the training programs.

The accomplishments of this effort may be summarized as follows:

NIH programs have contributed to the improvement of advanced training in the biomedical sciences; the number of top-quality faculty directing and participating in these programs has increased substantially over the past decade; research training programs have been strengthened to take advantage of scientific advances; departments of instruction in newly emerging disciplines have been initiated and their development supported; and the required interdisciplinary approach for training in such fields as bioengineering and human genetics have been made possible through the initiative role of NIH training programs.

NIH training programs have provided the possibility for enhancing the quality of health professions education by incorporating a research training experience. Moreover, the improved quality of this education made possible through support of faculty salaries, and by providing new and better equipment indirectly benefit as well those students not supported by the training grant.

In the support of training of clinical investigators, NIH has structured its research orientation from a broad viewpoint involving shortages in clinical as well as research areas; these programs have been designed to equip physicians with the diagnostic and therapeutic skills required for the understanding of specific disease processes.

NIH training programs have invested heavily in strengthening old and creating new centers. The environment is the point of maximum leverage, in the sense that the faculty transmits knowledge, instills competence, and evokes the spirit of inquiry which must provide the essential foundation not only for research training but for learning generally. Programs designed to build academic strength through support for training centers and university and medical school departments involve payment of faculty salaries and stipends for graduate students, and provision of equipment, supplies and necessary services. These programs represent investments with both short and long-term benefits. The stronger department not only gives better research training today; it will be better prepared to train larger numbers of graduate and undergraduate scientific professional students in the future and to give them better training than would otherwise have been possible. During

the past decade, the number of institutions receiving training support from NIH (including NIMH) more than doubled, rising from 230 to 510. Whereas only two institutions were awarded $1 million in training grants in 1957, 65 institutions located in 32 states receiving more than $1 million each in training grants in 1966.

Recent studies of training programs

(1) Now nearing completion is a study by the National Academy of Sciences of the training programs of the National Institute of General Medical Sciences, focusing primarily upon the predoctoral and preclinical training in general biological disciplines basic to the medical and health-related sciences; currently these programs amount to $35 million. Preliminary findings of this study show that:

(a) the time lapse between the baccalaureate to Ph.D. degrees for recipients of training support is one to two years less than for nonsupported trainees;

(b) half the number of pre-Ph.D.-supported trainees, and 80 percent of the pre-Ph.D.-supported fellows attain the Ph.D. degree;

(c) a larger proportion of doctorate recipients who nad NIGMS support assume immediate postdoctoral fellowships and continue in a research career, as compared with nonsupported Ph.D.'s;

(d) training grants had a measurable positive effect on Ph.D. production of academic departments; the gain in average Ph.D. output per department between 1958-62, and 1963-67 being markedly greater for the NIGMS-supported departments than for the nonsupported ones.

(2) In the clinical specialties, an evaluation of the clinical postdoctoral training program in the field of gastroenterology has been completed by the National Institute of Arthritis and Metabolic Diseases, with the cooperation of the American Gastroenterology Association. This study shows that 57 percent of the former trainees, for whom information was available, are involved in research, either full or part-time; more than three-fourths hold teaching assignments, almost all, however, devote less than 50 percent of their time to teaching, combining this activity with careers in research, or private practice; careers in private practice claiming more than half their time were reported by almost two-fifths of the former trainees.

In summary, NIH training programs have sharply reduced the time for completion of the training leading to a Ph.D. degree, assured a higher proportion of completions; and a high proportion of persons trained to pursue careers in research, teaching, and health-related services. This contrasts with Ph.D.'s trained in the non-health fields, where a high proportion of recipients of the Ph.D degree go on to careers in industry and management. Those trained in the health sciences, moreover, devote their careers to health and are fully occupied in the health area.

Evaluations-in-progress include studies by:

American Academy of Neurology; American Neurological Association; American Academy of Orthopedics; American Academy of Dermatology; Council on Pediatric Practice of the American Academy of Pediatrics; Committee on Anesthesia of the National Academy of Sciences.

Recent non-agency evaluations of training programs

(1) Report to the President - "Biomedical Science and its Administration, A study of the National Institutes of Health, 1965"

(2) Report of the Committee of Consultants on Medical Research to the Subcommittee on Departments of Labor and Health, Education and Welfare, (1960)

Abstracts from these reports are shown in the Appendix.

Does the program provide for adequate monitoring and evaluation of performance and do these affect program administration?

Training grants are awarded to training institutions on a competitive basis, after review by scientific committees of the intrinsic merit and relevance of the proposed training program. Requests for renewal of the training grant provide the opportunity for formal periodic re-evaluation of the grantee accomplishment in meeting program objectives; renewal of the grant is predicated upon acceptable levels of performance. During the grant year, necessary changes may also be instituted, under the grants administration procedures.

Should the program be consolidated with similar programs elsewhere within or outside of DHEW? If not, why not?

NIH training programs should not be consolidated with other programs. First, these programs are uniquely focussed on the development of highly-trained personnel in specific areas of science related to the disease-oriented missions of the Institutes; secondly, for maximum program effectiveness and utilization of funds, the process through which training funds are awarded must be highly selective; thirdly, the judgmental decisions as to program evolvement and direction

require a central administration, scientifically trained and in tune with today's science and tomorrow's promise to make the necessary determinations. No other Federal agency has the necessary mission-orientation to administer a program of this size and scope.

). Distribution and Recipient Data

Training grants are widely dispersed among 500 academic institutions and teaching hospitals located in 48 states, D.C. and Puerto Rico. Within these 500 institutions, training grants were distributed among nearly 2,500 different departments in the basic medical sciences and other fields relevant to health research and education.

Appendix tables 3, 4, and 5 provide data on the fields in which persons receiving stipend support are being trained; on the types of training institutions; and a regional and state distribution of grants and awards for training and fellowships in FY 1968.

(The specific questions listed in the format for this section are not applicable to the training and fellowship programs).

Budget Information

A. FY 1968-70 financial data - training and fellowship programs

Fiscal Years

(millions of dollars)

	1968	1969	1970 (revised)
Budget authority (appropriations)	$193.8	$197.8	$179.0
Obligations	187.1	197.7	179.0

B. Budget history, training and fellowships

(millions of dollars)

Division (NIH) Submission	Bureau (PHS) Recommendation	Agency (DHEW) Budget	President's Budget	Congressi[illegible] Action (Appropriatio[illegible])
$209.0	$205.2	$205.2	$194.6	$193.8
223.1	206.9	206.9	197.8	197.8
209.3	-	199.6	179.0	-

C. For FY 1970, the program is controllable.

gislative changes (recent)

ne.

Forward Plan

A. National Goals, Needs, and Program Objectives

As we look to the future, NIH will continue to bear primary Federal responsibility for programs involving biomedical research; the training of biomedical manpower required for teaching, research, and relevant patient care activities; and the development, maintenance, and strengthening of specific components of the institutional environment where research and training are carried on. These programs will also provide the necessary science base for the tremendous expansion and upgrading of physician education that is imminent.

A major characteristic of the NIH training programs from the beginning has been change, both in the nature of biomedical training and its environment as this has been influenced by the programs, and change in the programs themselves as they have continued to reflect the changing needs of biomedical science and medical training. Programs will continue to evolve in consonance with national goals and objectives in health, the specific objectives of the training programs, and the rising expectations of society for the best medical care for all our citizens.

Forces shaping the development of the training programs include:

- New challenges in research and medical care being posed by automation, by the development of new systems of health care;

- Emergence of biomedical science into an era of large-scale interdisciplinary effort requiring the utilization of increasingly complex instrumentation;

- Increasing importance of the basic biomedical sciences for a career in clinical investigation;

- Increasing necessity for a strong background in mathematics, engineering, and the physical sciences.

But NIH training programs, to be adequate to meet the critical needs before us will require:

- Developing the faculty in the health sciences required to permit the predictable expansion of existing medical schools, other health professional schools, and graduate schools and the creation of 25 new medical schools and 150 new graduate schools in the 1965-75 decade.

- Enlarging the supply of qualified biomedical research manpower in an increasingly diverse array of scientific disciplines, such as (a) behavioral sciences, (b) biomedical engineering, (c) genetics, ecology, and cell biology, (d) the mathematical and physical sciences as a new biological relationship.

- Providing the scientific staff required for the initiation of major biomedical research efforts in the national interest, e.g. cardiovascular research institutes, centers for the study of aging, dental research institutes, mental retardation research centers, cancer research institutes, pharmacology-toxicology research centers, cancer research centers, and eye research centers.

- Ensuring the availability of research-trained personnel for staffing medical centers and community hospitals as these capabilities are improved with the help of the developing Regional Medical Programs.

- Taking target-oriented action to expand, as rapidly as possible, the supply of biomedical manpower in critical shortage categories.

An illustration of the short-term requirements for biomedical manpower (presented in table 1) has been developed to quantify the conceptual needs in the nonprofit sector (The Nation's medical schools, other health-professions schools, the biomedical components of graduate schools, and the staffing needs of biomedical research centers, regional and community hospitals, and health centers, and the biomedical faculty for advanced undergraduate education).

Personnel are available for training in numbers sufficient to meet these goals in view of the rising trends in graduate enrollment, and the subsequent output of M.D.'s and Ph.D's in the sciences critical for biomedical research, teaching, and related services, and in the absence of dollar constraints, adequate physical facilities for research and teaching are assumed.

. Program Requirements

A detailed delineation of the Nation's future needs for trained manpower for biomedical research, teaching, and related services is presented in <u>Biomedical Research Manpower--For the Eighties.</u> [1]

As detailed in this publication, the best judgment projection of professional manpower requirements for research, teaching and related services, indicates the need for 71,000 trained professionals in 1970, 100,000 in 1975, and 130,000 in 1980. The additions to the trained manpower pool, required for the five year periods are as follows:

Period	Total	Additional Trained Manpower For Expansion (thousands)	For replacement due to deaths, retirement, and shifts to other occupations
1970-1975	38.8	29.0	9.8
1975-1980	43.0	30.0	13.0

Office of Resources Analysis, NIH, Resources for Medical Research Report No. 11, December 1968.

TABLE 1 —Illustrative List of High Priority Staffing Needs for Nonprofit Sector, 1967–75

Area of need	Number of institutions		Professional manpower	
	1967 base	1967–1975	1967 base	Needed by 1975
I. Medical Schools				
A. Expansion of existing schools	87	87	22, 500	36, 000
B. Upgrading of existing schools	40	40	(6, 000)	[1] (11, 000)
C. Establishment of new schools	16	25	1, 000	6, 000
II. Other Health Professional Schools [2]				
A. Expansion of existing schools	75	75	2, 200	4, 000
B. Upgrading of existing schools	25	25	(450)	(900)
C. Establishment of new schools	5	20	100	1, 000
III. Biomedical Components of Graduate Schools [3]				
A. Expansion of existing schools	75	75	5, 000	8, 000
B. Upgrading of existing schools	25	25	(1, 000)	(2, 000)
C. Establishment of new schools	25	75	400	2, 000
IV. Staffing of Specialized Biomedical Research Centers				
A. Cancer research centers	3	10	(600)	(2, 000)
B. Myocardial infarction research units [4]	5	12	(60)	(650)
C. Cardiovascular research and training centers	1	12	(50)	(1, 400)
D. Eye research institutes	13	20	(150)	(400)
E. Head injury research centers	4	12	(40)	(180)
F. Dental research institutes [5]	0	9	0	(1, 350)
G. Pharmacology-toxicology research centers	3	12	(75)	(500)
H. Environmental health research and training centers	3	25	(50)	(400)
I. Mental retardation research centers [6]	0	12	0	(900)
J. Institutes for the study of aging	0	4	0	(360)
K. General clinical research centers	91	125	(400)	(1, 000)
L. Biomedical computing centers	43	60	(250)	(500)
M. Biochemical, instrumentation, biological materials production, and scientific information centers	16	30	(200)	(360)
N. Regional primate research centers	7	10	(150)	(300)
V. Research and Continuing Education Staffing of Community Hospitals in Regional Medical Program Network	0	4, 000	0	[7] 6, 000
VI. Biomedical Faculty for Advanced Undergraduate Education	0	200	0	1, 000
Total			[8] 31, 200	[8] 64, 000

[1] Numbers in parentheses () are not additive; they are already encompassed in national estimates for biomedical research or they involve part-time faculty participation.

[2] Other health professional schools include schools of dentistry, veterinary science, pharmacy and public health. Data for 1967 are projected forward from the 1965 base. For the short-term needs of dental schools, see *Manpower for Dental Research*, 1963, 1970, National Institute of Dental Research, May 1962.

[3] Biomedical components include graduate programs in anatomy, biochemistry, molecular biology, cell biology, genetics, pharmacology, physiology, pathology, bioengineering, behavioral sciences (excluding clinical psychology), neurosciences, biomathematics, and environmental sciences. Programs planned by new graduate schools are discussed in a progress report to NIH on the *Study of the Future of Higher Education, 1965–1985*, Academy for Eductional Development, Inc., Oct. 1, 1967 (unpublished). The final report of this study dealing with probable major expansions of graduate and professional education, should be available early in 1969.

[4] The total of 12 myocardial infarction research units by 1975 is expected to be supplemented by about 50 clinical testing units. The total staff for both types of units is expected to be 650 by 1975.

[5] The first five Dental Research Institutes were funded in fiscal year 1967, staffing not begun.

[6] All 12 centers have been funded for construction on a 3 to 1 matching basis by the National Institute of Child Health and Human Development.

[7] The estimate of 6,000 full-time equivalent professional workers for research and continuing education staffing of community hospitals in the regional medical program network by 1975 is believed to be conservative. It is estimated that 1½ to 2 full-time equivalent health and medical professional personnel will be involved per hospital. Staff of the division of regional medical programs estimates that the number of community hospitals participating in the RMP network may well exceed 4,000 and reach 5,000 by 1975; if this estimate proves valid, an additional 2,000 full-time equivalent professional workers would be needed.

[8] The professional manpower estimates of 64,000 by 1975 for the high priority staffing needs (and the related 1967 base of 31,200) cover only the designated components of the nonprofit sector and, therefore, do not encompass total requirements for professional research manpower in this sector. Specifically omitted from the 1967 total are investigators who are exclusively engaged in biomedical research in the hospital setting, in undergraduate science departments of liberal arts colleges and universities, in nonprofit research institutes, and scientific associations. However, a considerable proportion of these additional requirements for 1975 are included implicitly in the needs of the high-priority group since it may be assumed that investigators conducting research in these settings, will increasingly hold staff appointments at another component of the nonprofit sector, i.e. a combination of a staff appointment at a medical school and participation in biomedical research at a hospital.

It must be emphasized that many, but not all, of those who will complete their training in the early 1970's are already in the training process. This is so because the training process under the most optimal circumstances requires a period of about four years at the predoctoral level, with a further two to three years for those who continue in the training program at the postdoctoral level. For the M.D. to become an independent clinical investigator and teacher requires a period of eight to ten years following graduation from medical school. (In the NIH training programs, about two-thirds of the persons in training at the postdoctoral level are physicians.)

Thus, the 1971-75 NIH training program will, in the main, provide the required professional manpower additions for the mid or late 1970's.

1. The estimated numbers of persons to be supported under NIH programs in order to permit a realistic achievement of the national objectives set forth in A above, and the manpower requirements for the late 1970's, as delineated in Biomedical Research Manpower--For the Eighties, are as follows:

'iscal Year	Total	Predoctoral	Postdoctoral
		(thousands)	
1971	31.6	19.0	12.6
1972	33.2	19.9	13.3
1973	35.1	21.1	14.1
1974	37.0	22.2	14.8
1975	38.9	23.4	15.6

This training plan is based on (a) continuation of the 1965 percentage of predoctoral trainees to graduate enrollment in the selected sciences, (7 percent); (b) the current ratio of predoctoral (60 percent) and postdoctoral (40 percent) of the total numbers supported; and (c) a conservative estimate of a 5 percent annual increase in the cost of training. If the estimate of increased cost proves too low, then the budgetary figures presented in C below will be understated; if, on the other hand, the cost of training does not increase at this compound rate, then the budgetary figures are overstated.

2. Three estimates are presented of alternative program levels if different aspects of the 1970 situation are assumed for the FY 1971-75 period.

   (a) A continuation for 1971-75 of the FY 1970 Budget dollars for training, $179 million would provide funds for the support of the following numbers of persons, assuming a 5 percent annual increase in the cost of training and continuing the current ratio of predoctoral (60%) and postdoctoral (40%) of

the total numbers supported:

Fiscal Year	Total	Predoctoral (thousands)	Postdoctoral
1971	17.3	10.6	6.7
1972	16.5	10.0	6.4
1973	15.7	9.6	6.1
1974	15.0	9.1	5.8
1975	14.2	8.7	5.6

This will provide training for about one-half of the numbers required, as shown in B 1 above, and the percentage of graduate students enrolled in the selected sciences who are supported by NIH programs would fall from the 1965 ratio of 7 percent, to 4 percent in 1971; 3.5 percent in 1972; 3.2 percent in 1973; 2.9 percent in 1974, and 2.1 percent in 1975.

(b) Assuming a continuation to 1975 of the <u>numbers</u> of students supported in 1971, by the level of funds in the FY 1970 budget:

Fiscal Year	Total	Predoctoral (thousands)	Postdoctoral
1971	17.3	10.6	6.7
1972	17.3	10.6	6.7
1973	17.3	10.6	6.7
1974	17.3	10.6	6.7
1975	17.3	10.6	6.7

This will provide training for about one-half of the numbers required, as shown in B 1 above, and the percentage of graduate students enrolled in the selected sciences who are supported by NIH training programs would fall from 4 percent in 1971; to 3.7 percent in 1972; 3.5 percent in 1973; 3.3 percent in 1974; and 3.2 percent in 1975.

(c) Assuming a continuation to 1975 of the ratio of predoctoral trainees supported in 1970,[1/] as a percentage of graduate enrollment in the selected sciences (4.4%), a continuation to 1975 of the ratio of predoctoral (60%) to postdoctoral trainees (40%), and a 5 percent annual increase in the cost of training; the numbers supported are as follows:

Fiscal Year	Total	Predoctoral (thousands)	Postdoctoral
1971	19.9	11.9	7.9
1972	20.9	12.5	8.3
1973	22.1	13.3	8.8
1974	23.3	14.0	9.3
1975	24.5	14.7	9.8

FY 1970, 18.7 thousand students will be supported (11.5 predoctoral and 2 postdoctoral) from fellowship funds obligated in FY 1970, and training nt funds obligated in FY 1969.

This will provide training for only about three-fifths of the number required, as shown in B 1 above.

C. Budget Projection - dollar requirements

The budget figures shown below cover costs of student stipends and allowances, and environmental institution support for the training--faculty salaries, equipment, and related costs.

The dollar estimates reflect the funds required to support the numbers of students in a given year, and do not reflect the forward financing aspect of the training grant program.

1. (a) The dollar requirements to finance the optimal training programs shown in B 1 above are as follows:

Fiscal Years	(millions of dollars)
1971	$332.9
1972	367.3
1973	408.3
1974	452.0
1975	498.9

(b) The dollar requirements to finance the programs shown in B 2 above are as follows:

(1) For B 2 (a) the dollar requirements are a continuation of the FY 1970 budget: $179 million a year

(2) For B 2 (b) the dollar requirements, for a continuation, 1971-1975, of the numbers of students supported in 1971 at the same level of funding as the FY 1970 Budget, assuming a 5 percent annual increase in the cost of training, are as follows:

Fiscal Years	(millions of dollars)
1971	$179.0
1972	188.4
1973	197.9
1974	207.8
1975	218.2

(3) For B 2 (c) the dollar requirements are as follows:

Fiscal Years	(millions of dollars)
1971	$209.2
1972	230.9
1973	256.7
1974	284.1
1975	313.6

2. Alternative methods

To assure the flow of manpower, trained in the disciplines and techniques required for effective careers in research, teaching and related services, desirable alternatives to a continuation of the present system of selective support after peer review are not apparent, with the Federal Government continuing to provide financial support for both training institution and student. Changes in the mechanisms whereby support is channeled may come, but these will not affect the total dollar outlays required. Such changes as shifts from fellowships to training grants, or providing support of the institution's training costs through the general support mechanism, may be deemed appropriate as the programs develop over time. But to assure the mission-orientation of the training curriculum, and to assure the quality of the person trained, a cohesive and centrally directed program is imperative.

Legislative Requirements

None.

Appendix

Table 1

NIH RESEARCH TRAINING AND FELLOWSHIP PROGRAMS:
Total Obligations, FY 1966-1969
(thousands of dollars)

Program	Fiscal years			
	1966	1967	1968	1969 est.
tal, NIH	$168,676	$182,505	$187,144	$197,727
elowships	47,507	50,630	54,496	58,737
edoctoral	8,544	8,234	7,875	8,073
stdoctoral	16,185	17,104	19,781	21,243
Postdoctoral	(8,014)	(7,999)	(8,790)	(9,185)
Special	(4,918)	(5,920)	(7,124)	(7,943)
Foreign	(1,199)	(1,208)	(1,564)	(1,715)
Traineeships	(2,054)	(1,977)	(2,303)	(2,400)
reer Awards	22,778	25,292	26,840	29,421
RCA	(4,775)	(4,811)	(4,551)	(4,797)
RCDA	(18,003)	(20,481)	(22,289)	(24,624)
ining Grants	121,169	131,875	132,648	138,990
redoctoral	45,704	49,429	50,274	52,677
ostdoctoral	75,465	82,446	82,374	86,313
Postdoctoral	(67,826)	(73,354)	(73,354)	(76,861)
Other	(7,639)	(9,092)	(9,020)	(9,452)

Appendix

Table 2

NIH RESEARCH TRAINING AND FELLOWSHIP PROGRAMS:
Number of Students Receiving Financial Support, FY 1966-1969

Program	Fiscal year			
	1966	1967	1968	1969 est.
tal, NIH	20,081	21,242	19,958	19,440
lowships	4,780	4,713	4,734	4,740
edoctoral	1,581	1,586	1,556	1,430
stdoctoral	2,090	1,968	2,021	2,100
Postdoctoral	(1,214)	(1,086)	(1,058)	(1,080)
Special	(504)	(522)	(579)	(620)
Foreign	(166)	(166)	(181)	(190)
Traineeships	(206)	(194)	(203)	(210)
reer Awards	1,109	1,159	1,157	1,210
RCA	(184)	(176)	(163)	(160)
RCDA	(925)	(983)	(994)	(1,050)
ning Grants	15,301	16,529	15,224	14,700
redoctoral	9,975	10,754	10,474	10,100
ostdoctoral	5,326	5,775	4,750	4,600
Postdoctoral	(5,154)	(5,571)	(4,550)	(4,400)
Other	(172)	(204)	(200)	(200)

ot: Training grants are foward financed; that is, funds for the support of students under training grants are obligated in the year prior to the training.

Appendix

Table 3

NIH RESEARCH TRAINING AND FELLOWSHIP PROGRAMS: Number of Students Receiving Financial Support, by Major Field of Training, FY 1968

Fields	Number
Total	19,958
Basic medical sciences	9,212
Other biological sciences	2,547
Clinical medicine	5,038
Clinical dentistry	157
Other health-related professional fields	1,413
Social work	2
Nursing	3
Other	1,408
Behavioral sciences	830
Psychology	523
Other	307
Mathematics, physical sciences and engineering	743
Other	18

Appendix

Table 4

NIH RESEARCH TRAINING AND FELLOWSHIP PROGRAMS:
Number of Students Receiving Financial Support,
by Type of Institution, FY 1968

Type of institution	Number
Total	19,958
Academic Institutions	18,513
Health professional schools	12,339
Medicine	11,090
Osteopathy	-
Dentistry	264
Public Health	549
Pharmacy	161
Veterinary Medicine	275
Other schools	6,174
Arts & Sciences	4,766
Agriculture	468
Engineering	385
Social Work	3
Education	2
Other	550
Non-Academic Institutions	1,443
Hospitals	780
Research Institutes, Foundations, Laboratories	462
Graduate Training Center	8
Patient Center	50
Government Unit	62
Associations, Societies, and Councils	81
Foreign	222

Appendix

Table 5

NIH RESEARCH TRAINING AND FELLOWSHIP PROGRAMS: Grants and Awards, by Region and State, FY 1968
(thousands of dollars)

Region and State	Amount
Total	$184,217 1/
New England	24,166
Maine	216
New Hampshire	440
Vermont	582
Massachusetts	17,630
Rhode Island	632
Connecticut	4,666
Middle Atlantic	36,112
New York	23,314
New Jersey	1,296
Pennsylvania	11,502
East North Central	29,014
Ohio	5,794
Michigan	5,026
Indiana	2,918
Illinois	10,433
Wisconsin	4,843
West North Central	16,421
Minnesota	6,468
Iowa	2,270
Missouri	4,906
North Dakota	172
South Dakota	113
Nebraska	715
Kansas	1,777
South Atlantic	26,366
Delaware	7
Maryland	7,142
District of Columbia	2,003
West Virginia	442
Virginia	2,339
North Carolina	8,101
South Carolina	423
Georgia	2,246
Florida	3,663
East South Central	7,039
Alabama	1,606
Mississippi	735
Tennessee	3,336
Kentucky	1,362
West South Central	9,835
Louisiana	2,453
Arkansas	230
Oklahoma	1,273
Texas	5,879
Mountain	4,893
New Mexico	170
Arizona	392
Nevada	-
Utah	1,775
Colorado	2,419
Wyoming	7
Montana	130
Idaho	-
Pacific	30,371
California	21,325
Oregon	2,347
Washington	5,839
Alaska	25
Hawaii	255
Puerto Rico	580

1/ In FY 1968, obligations for the training and fellowship programs amounted to $187,144 thousand.

iomedical Science and its Administration," a study of the National Institutes f Health, 1965:

..In universities and medical schools the performance of research is inextricably interwoven with the teaching of students. Such interrelationship is not only an undeniable fact of academic life; it is, we think, a very desirable fact of academic life. Scientific research and higher education should not and cannot be dissociated. Current biological discoveries constitute the useful immediate

products of the NIH-supported research projects; future discoveries will largely depend on the effectiveness of today's scientist/teachers, frequently aided by NIH training grants, in instructing and inspiring the next generation of health research scientists....On the basic question there was complete unanimity in the opinions expressed, as well as in the supporting judgments of our own panel members: the NIH programs have been of enormous benefit to the universities and medical schools. In case after case we learned that institutions had, because of NIH support, been able to build up their health research activities to a much higher level of quality and quantity than would otherwise have been possible; and through the NIH training grants serious deficiencies in research talent available for exploitation of important fields of life science had been systematically ameliorated (see, for example, the reports of the Panels on Pathology, Biochemistry, Biophysics, and Behavorial Sciences). Despite the preponderance of funding for research rather than training, the quality of instruction in the medical schools and life sciences departments has been much improved as a consequence of the Federal program. To quote the Behavorial Sciences Panel, "The availability of stimulating researcher-teachers, and the new areas of interest and inquiry which they bring to their instruction, arouse greater interest in students than did the exclusively clinical doctrinaire instruction which is steadily being supplanted." pp. 4, 5.

- Report of the Committee of Consultants on Medical Research to the Subcommittee on Departments of Labor and Health, Education and Welfare (1960):[1]

"The Committee of Consultants began its review of the Federal program in support of medical research with certain assumptions which it found to be sound on the basis of information obtained and the opinions heard in the course of its survey. These assumptions have now become firmly held convictions.
(1)The health of the people is the greatest resource of the Nation, absolutely vital to its welfare, economy, and security.
(2)The present state of the Nation's health, although greatly improved since the beginning of the century, is still far from the goal of assuring that as many of our population as possible live full and active lives, not warped or blighted by disease. . .
(3)The only way we can hope to lessen this burden in the future is through progress in medical research and the practical application of research findings.
(4)Medical research has already proved its value in both humanitarian and economic terms. . .
(5)The American people have demonstrated through their Congress and through their private voluntary contributions that they consider it essential and urgent to support a determined attack on the dread diseases through research.
(6)The magnitude of that attack and the program of medical research to be supported will be determined by the degree of urgency felt by the people of the United States in obtaining answers to the problems of prevention and treatment of serious disease. The Committee believes the urgency is such that it can be satisfied only by the maximum utilization of the medical research potential of the country, as well as the contributions of competent investigators abroad."

"The research grant, training grant, and fellowship programs of the National Institutes of Health over the past 15 years have constituted the most important single force in raising the standard of medical research, teaching, and practice in the United States to its present high level. It is of paramount importance that these programs receive support in proportion to the rate of growth anticipated."

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[1]U. S., Congress, Senate, Federal Support of Medical Research, 86th Cong., Sess., May 1960 (Washington: U. S. Government Printing Office, 1960), roduction xxv, xxvi.

PROGRAM REPORT AND PLAN 1971 - 1975

NATIONAL LIBRARY OF MEDICINE

SUMMARY

I. Goals

The National Library of Medicine facilitates access to biomedical information essential to the support of the health team.

II. Program Objectives

Accelerate the flow of information from origin to user by adoption of innovative technologies: (1) To acquire, store and retrieve textual materials required to produce general and discriminating bibliographic compilations as needed by the health team, its sub groups, and its individual members, and to provide copies of documents as requested for their use. (2) To share these capabilities with other medical libraries through a Regional Medical Library system, which requires some increase in their human resources, plant and equipment. (3) To develop, produce, acquire and distribute health information in audiovisual formats organized for access and retrieval in the interests of efficiency and economy to meet unfilled critical requirements of the health team. (4) To interconnect local and regional communications facilities into a prototype network for test and evaluation permitting ultimate development of an extensive information network comprised of advanced computer and telecommunications equipment and techniques linking major health facilities, medical education centers, information repositories, and health professionals. (5) To provide information relating to the harmful effects of chemicals on humans promptly and efficiently through a network of information services.

III. Approximation of Objectives to Needs

Within each of the stated objectives is a series of subsets essential to their attainment, which vary in priority according to value judgments based on knowledge of costs and the state of the art:

Objective	Realistic	'70 Level Output
1	92% (80 - 100)	60% (33 - 86)
2	74% (21 - 100)	44% (0 - 84)
3	59% (30 - 100)	24% (15 - 38)
4	47% (5 - 60)	5%
5	15% (2 - 25)	1 - 2%

IV. Budget Projection (in thousands)

	1970	1971	1972	1973	1974	1975
Grants	6,492	22,400	25,000	27,800	30,500	31,000
Direct Operations	13,890	21,200	27,100	33,200	38,100	42,100
Total	20,382	43,600	52,100	61,000	68,600	73,100

Note: Excludes construction. See Table XVI - page 30, and Appendix I, page 34.

V. Legislative Requirements

Extension and some modification of authorities contained in Medical Library Assistance Act of 1965, now codified as Sec. 393-399 of Title III, Part I, of the Public Health Service Act, which expire June 30, 1970.

VI. Administrative Changes

None.

PROGRAM REPORT AND PLAN 1971-1975
NATIONAL LIBRARY OF MEDICINE

APRIL 1969
(Revised)

A. PROGRAM OBJECTIVES

I PROGRAM BACKGROUND

The National Library of Medicine, the world's largest specialized library, provides modern technical, bibliographic and reference services, and from its beginning in 1836 has organized the medical literature to facilitate access. Its first clients were military medical officers concerned with problems of clinical medicine and public health. As medicine developed its scientific base, that too was collected and organized in textual formats, supplanted in 1964 by the Medical Literature Analysis and Retrieval System, MEDLARS, a computer controlled mechanism for organizing, storing, retrieving, and photo-composing compilations of bibliographic citations needed by health professionals and all others who support the national health effort.

The Library's basic legislation is contained in PL 84-941 enacted in 1956 "to promote the progress of medicine and to advance the national health and welfare by creating a National Library of Medicine." The Armed Forces Library of Medicine was renamed and transferred to the Public Health Service, Department of Health, Education, and Welfare. Governance is vested in the Director and a Board of Regents which includes ten distinguished citizens appointed for four-year terms by the President, and seven Federal officials who serve *ex officio*.

The growth of scientific research since World War II has produced an explosion of scientific and technical information in many fields, including biomedicine. Gaps of varying width have appeared between the availability of new knowledge and its utilization for social purposes. The President's Commission on Heart Disease, Cancer and Stroke recommended a major effort to improve communications for research and service in 1965. PL 89-291, the Medical Library Assistance Act, was signed into law the same year, providing an authorization of $95,000,000 over five years to support, through grants and contracts, activities designed to strengthen medical libraries and facilitate communications among the medical communities concerned with teaching, service and research.

Further emphasis on communications research as a function of the NLM was included in "Investigation of HEW," a report by a Special Subcommittee of the Committee on Interstate and Foreign Commerce, House of Representatives, 89th Congress, in 1966. This resulted in the transfer of the National Medical Audiovisual Center to the NLM. The NLM created a National Center for Biomedical Communications after passage of PL 90-456, a Joint Resolution, which named the facility to house that vigorous communications research program the Lister Hill National Center for Biomedical Communications.

Such activities as are accurately quantifiable are listed in Table I for fiscal years 1967-1969. Some items are included which relate to workload as a measure of the biomedical public's demand for service. The entire budget for the NLM is contained under the PPBS rubric 241300 Medical Libraries and Biomedical Communication Programs.

B. PROGRAM OPERATIONS

The Federal Government became involved in medical librarianship to support the military. Recognition of a similar responsibility to civilian medical personnel was contained in the Hawley Report in 1948 and repeated by a succession of Committees and Commissions until enactment of PL 84-941 creating the National Library of Medicine. The United States has earned its prestige by providing support for education at all levels of its social structure. Continuing education beyond the formal academic process is essential to vigorous science and technology. No organization other than the Federal Government has resources adequate to cope with the burgeoning biomedical literature which compresses centuries of progress into years. No other organization can provide for the continuity essential to the better health that is recognized today as a civil right rather than a privilege for the economically advantaged. The Federal Government must assume the role of leadership of other governmental, philanthropic, professional, and industrial organizations, participating in and contributing to this social movement. Increasing specialization and fragmentation of the groups involved in the national health effort underlie their communications problems. The Library's programs are directed towards synthesizing and integrating the information systems that serve them through use of innovative technologies. Some degree of standardization to insure compatibility is essential to conserve resources and to use them effectively and efficiently. Otherwise a cottage-type, do-it-yourself industry will grow even larger, increasing in complexity, cost and parochial orientation.

Substantial state and private funds support educational enterprises, including the developing national network of medical libraries. Library Resource and Regional Medical Library grants permit such organizations to increase and extend their services to broader communities.

Non-governmental participation with NLM programs is increasing. An information processing industry is developing to provide computer-based publications and search services commercially. Their engagement with biomedical problems is growing slowly, but no industrial data base or library resource comparable to the NLM is now available.

Non-profit institutions and associations constitute NLM grantees under PL 89-291. Construction grants require cost sharing. Of the eleven recurring bibliographies produced by the NLM, six are supported by professional organizations, and the other five by Federal agencies in something akin to a partnership. The Pharmaceutical Manufacturers Association cooperates with NLM in providing the industry a MEDLARS search capability.

TABLE I

REPRESENTATIVE OUTPUTS

NATIONAL LIBRARY OF MEDICINE

	Fiscal Years			
	67	68	69(est.)	70(est.)
le Requests Serviced	92,000	94,000	95,000	95,000
ibrary Loan Requests	170,000	160,000	140,000	130,000
vation Pages Filmed	2,825,030	2,050,000	3,410,000	750,000
ing Bibliographies	10	12	16	21
ed Literature Searches ributed	19,000	18,500	20,500	25,000
Searches Released	5,050	7,673	11,200	15,000
Picture and vision Productions	106 30	101 38	63 47	50 104
Picture Footage	4,000,000	4,900,000	4,000,000	4,000,000
isuals Loaned	71,000	93,000	85,000 1/	100,000
isuals Sold	5,000 estimated	7,200	10,400	11,500

es not reflect demand. Distribution was limited by budget constraints.

The publishing and film industries are completely responsive to the Library's need for suppliers, and industrial contractors provide skills and abilities not available through direct employ.

In view of the Federal leadership required to develop a modern national communications system for biomedicine comprising a variety of participants and beneficiaries serving a national health objective, one anticipates a continuing need for Federal participation for the foreseeable future.

C. EVIDENCE OF PROGRAM EFFECTIVENESS

If imitation is the sincerest form of flattery, then the NLM is doing a good job as other interests turn to computer-based systems to compile a variety of bibliographic citations. Groups in Sweden and the United Kingdom are using MEDLARS tapes to serve their program objectives, and American organizations are following suit without Federal subsidy. Requests for additional MEDLARS facilities have been received from France, West Germany, Japan, Yugoslavia and Australia.

The MEDLARS system provided for monitoring and evaluating performance from the very beginning. Moreover, F. W. Lancaster joined the NLM staff in December 1965 to perform an evaluation aided by an Evaluation Advisory Committee of Federal and non-Federal experts to assure complete impartiality. The final report, issued in January 1968, identified its success as well as deficiencies in the system arising in part from a tendency for compartmentalization of indexing, searching, and Medical Subject Heading (the controlled vocabulary essential to storage and retrieval), requiring greater integration of these activities with greater attention to terminology actually used by clients. Action has been taken to reduce such compartmentalization, and service has been improved.

The concept of NLM being more responsive to its clients by decentralizing some of its activities to selected regional libraries has been acclaimed enthusiastically as evidenced by the will to participate in indexing and to provide interlibrary loans from libraries closer to the user. The immediate result has been a decline in loans provided by the NLM.

Closer relations with the biomedical activities of the DHEW other than the NIH would be welcome. For example, an article should be indexed once for all parties at interest because of the enormous capacity of digital computers for storage and retrieval. Those programs concerned with communication and utilization of research results in medical practice should become more familiar with the need for national networking as opposed to local and regional plans, to define the scope and limitations of each, thus reducing costs.

D. DISTRIBUTION AND RECIPIENT DATA

While the NLM serves the entire health effort, one suspects that it is used most frequently by medical scientists and educators as compared to practitioners. Increased efficiency and minimal cost are achieved by encouraging users not in the immediate locale to approach the NLM through local libraries. This prevents an accurate appraisal of exactly who uses the NLM and for what purposes. However, experience with distribution of Selected Literature Searches indicates that about 52 percent of requests originate in purely medical environments from academic medical center to practitioner's office, 13 percent from industrial and commercial enterprises, a like proportion from academic though non-medical interests, and the remainder from foundations, research institutes, health agencies and laymen.

The NLM doubts that bibliographic citations, its principal product, are completely responsive to the needs of physicians in private practice. Perhaps the upgrading of hospital libraries through PL 89-291 is more effective in that regard, but the availability of annotated bibliographies may be even more important provided a capability for transmitting such abstracts cheaply and efficiently can be developed. The Library is also considering the impact of new varieties of health professionals on its obligation to organize their literature, which will as surely emerge as will the new scientific areas important to increasing effectiveness in solving health problems rather than merely coping with them.

The traditional library programs of the NLM in modern guise are deemed responsive to the needs of those physicians who consistently use libraries, about 5 percent of the whole. MEDLARS was designed expressly to meet their needs. Other needs of the biomedical community are met less effectively. Specifically those whose interests center on chemicals which may become useful drugs or those concerned with environmental pollution by chemicals find the controlled vocabulary less than adequate. Therefore the NLM instituted a Drug Literature Program during 1966 to solve the problem of access to knowledge about pharmaceuticals, to which was added a Toxicology Information Program in 1967 in response to a report of the President's Science Advisory Committee, "Handling of Toxicological Information." A Toxicity Bibliography, now in its second year, is the first step in the evolution of clearinghouse, referral and evaluation functions determined by continuing survey of user needs.

A highly industrialized civilization and advances in organic chemistry have made possible the synthesis of millions of completely new compounds. The number and variety of chemical compounds which affect man in the form of industrial and municipal wastes, water and air pollutants, fertilizers, pesticides, cosmetics, food additives, and drugs constitute a public health problem of major proportions and are properly a concern to the nation.

It is intended to interlink the hundreds of data and information centers which exist in academic communities, in industry, and in government rather than develop a large Federal resource center. The network, when fully operational, will permit access to both published and unpublished information as well as to computer-stored data relating to adverse effects of chemical compounds on the human organism.

The further development of these several programs of the NLM are in the public interest for accelerating progress in delivery of health services as well as furthering the biomedical research effort. The rate of their development will be determined quite properly by a variety of considerations beyond the scope of the Library's expertise.

II. NATIONAL LIBRARY OF MEDICINE BUDGET INFORMATION (Program category 241300 = Medical Libraries and Biomedical Communications Programs).

A. Budget Authority and Outlays

	FY 1968	FY 1969	FY 1970
Budget authority..........	$21,674,000 1/	$18,160,500	$19,682,000
Outlays..................	13,112,000	22,309,000	22,055,000

1/ FY 1968 budget authority consists of an appropriation of $19,912,000 and a transfer of $1,762,000 from "Communicable Diseases"

B. Budget History

	FY 1968	FY 1969	FY 1970
Estimate to NIH........... (to PHS in 1968)	$31,816,000	$43,788,000	$28,093,000
Estimate to DHEW..........	31,632,000	32,324,000	29,093,000
Estimate to BoB...........	30,785,000	29,112,000	24,193,000
President's Budget........	21,162,000	19,172,000	22,182,000
Revised President's Budget	...	...	19,682,000
Appropriation.............	19,912,000	18,160,500	...

C. Committed and Discretionary Amounts in FY 1970 Budget Request

<u>Committed</u>

The total amount of $5,792,000 in new authority requested for grants in FY 1970 relates to continuation grants.

The 1970 Budget Request includes $11,719,000 for salaries and other expenses necessary to maintain direct operations output at the 1969 level. This amount is committed in the sense that reductions below this level would probably require reduction-in-force actions, withdrawal or severe curtailment of current services, and extensive reevaluation of the goals and objectives of the NLM. This committed amount includes the base for the substantial investment already made in MEDLARS II plus the

increase contained in this budget for continuing the installation of the system. The main frame and associated computer hardware have been delivered and in excess of $2,000,000 has been committed for software and systems development.

Discretionary

The balance of approximately $2,177,000 represents program increases remaining in the 1970 budget for the Library Operations, Toxicology Information, and National Medical Audiovisual programs. Also included in the discretionary category are the entire program bases for the Lister Hill Center and Toxicology information activities exclusive of personnel currently on board and direct service outputs of these programs. In effect, the discretionary amounts correspond to development projects which are funded through contracts with private sector profit and non-profit enterprises. Together, the Lister Hill Center and Toxicology information programs involve investments in previous years totalling approximately $3,000,000.

III. Legislative Changes

There have been no recent changes affecting the National Library of Medicine.

IV. Forward Plan

A. National Goals, Needs and Program Objectives

This is presented in the context of on-going programs of considerable maturity and of more recent programs in developmental phases whose products are still in experimental or formative stages.

LIBRARY OPERATIONS

The ultimate goal of all library operations is to provide useful and timely information services to the health team. As the services generated along traditional lines reach a point of saturation in terms of the Library's ability to deliver and/or the user's ability to absorb and use this information effectively, the need for extending these services to newer and more effective media and methods of transmission resulting from modern technology becomes vital. De-emphasis and limits for some of the more conventional media follow. The ability to maintain and to accommodate to demands for increasing service depends heavily on major developmental research and support programs.

The Library can maintain its central role in providing services to the user by increased training of information specialists, through decentralization and regionalization of information gathering and information dissemination, through development of communication linkages to other information sources, and through the generation of newer media. Through interlibrary loan services we are able to deliver scientific documents to the ultimate user. The use of photocopy keeps the original documents available for other user requests. The establishment of regional libraries has made it possible to approach the saturation of national needs for this purpose, realistically achievable within three or four years. This means of transmitting documents has a practical upper limit. Other means of delivering documents needs to be established to provide for growing requirements. The use of resource grants is intended to provide documents that are commonly required at the user level in small libraries and community hospitals. The development of a graphic image storage and retrieval system will generate greater capability for providing documents. As such resources develop over the next three years, we would project an actual decrease in the need to provide interlibrary loans for high use and commonly available publications. This will permit concentration by the National Library of Medicine on demands for less accessible documents.

The use of modern computer technology has made it possible to generate bibliographic tools such as _Index Medicus_ and _Current Catalog_ on a timely basis. The practical limit of manpower has made it necessary to develop resources throughout the world for the analysis of the literature for input into our MEDLARS system. This capability is well established and resources have been developed which can generate such major bibliographic tools to the limit which is practical for use.

Other media need to be established to meet the growing need for more discriminating bibliographic information available to the user. A major advance has been the generation of specifically oriented bibliographies and literature searches for specialized user needs. This capability is developing rapidly and should reach its point of saturation as a medium by 1975.

The generation and use of technical products for professional information specialists, such as the librarian and the cataloger, have been initiated with the establishment of an express book catalog and the capability of generating catalog cards from our computer store. Extension of these services through union serial and book catalogs is just beginning, and the development of these capabilities through the period ending 1975 will begin to approach the full capabilities of this resource. Much of this capability depends on improvements in MEDLARS.

MEDLARS II

In 1968 the National Library of Medicine awarded a contract to Computer Sciences Corporation for the design and installation of a second-generation Medical Literature Analysis and Retrieval System (MEDLARS II) to replace the current system which was installed in 1964. The plan calls for a 3-4 year project of incremental upgrading, with first-phase operations on the new equipment scheduled for early 1970.

When fully operational the MEDLARS II computer system will incorporate: (1) increased processing capability; (2) intermediate access storage; (3) time-sharing; and (4) on-line access to data bases from remote terminals. Translated into program capabilities, these new features will provide: (1) a greatly increased file capacity which will allow the maintenance of abstracts on the data record; (2) quicker response to an increasing volume of bibliographic service requests including demand searches and recurring bibliographies; (3) more current data through on-line record up-dating; (4) an automated acquisition and cataloging system with cataloging data availability to and from other medical libraries through remote terminal access to the NLM record files; (5) development of specialized information services supporting the toxicology information and drug literature programs through the addition of chemical structure search capabilities in the new system; and (6) support of data processing and data transmission activities of the biomedical communications network.

EXTRAMURAL PROGRAMS

The objectives of the Extramural Programs which administer the Medical Library Assistance Act are designed to strengthen the non-governmental sector's ability to deliver library and information services locally and regionally. These programs are thus complementary to and inter-related with the Library's Intramural Programs with which they are closely coordinated. For example, the Regional Medical Libraries, funded by grant, become partners in a Regional Medical Library System administered by Library Operations and their service functions are integrated with those of the National Library of Medicine itself.

Effective local distribution points are essential to the Library's total program. The support provided during the first five years of the Medical Library Assistance Act has made an appreciable impact on increasing the service capability of local institutions. Continuing support is required under the proposed renewal of the Medical Library Assistance Act in order:

1. to meet the increasing local demands for services, and
2. further to strengthen the locally functioning and responsible units of the developmental Biomedical Communications Network.

NATIONAL MEDICAL AUDIOVISUAL CENTER

The program objective is to meet unfilled, critical audiovisual requirements in health-professional curriculums and national health information programs by providing intensified educational consultation and support through the development, production, acquisition, utilization, evaluation, and distribution of motion pictures, video tapes, and other audiovisual forms. This plan provides for the most efficient and economical dissemination of health information, in audiovisual format, to the health professions, and relates to the development of effective audiovisual communications delivery systems.

To meet the national needs over and above the contributions of professional schools, the medical community, and educational/production organizations, will require the production and duplication of 10,000 biomedical video tapes, motion pictures, filmstrips, slide series, and audio tapes; loan and sale of 1,300,000 audiovisuals; on-site surveys, seminars, and workshops on biomedical audiovisual communications needs for 825 schools of the health professions; training 375 biomedical communication specialists for departments of biomedical communication and learning resource centers; expansion in clearinghouse operations for automated audiovisual information retrieval and catalog production; and the stimulation of production, exchange, and use of biomedical audiovisual material on a national and international basis.

DEVELOPMENTAL PROGRAMS

The programs described above are operational, with records of performance and measurable products and services which provide indicators of their ability to meet various proportions of the national need under specified budgetary conditions.

The Library's programs under development to supply long-range solutions to critical communications problems lack a basis of operational experience on which their outputs can be realistically calculated. Considerable effort has been expended, however, in quantifying the national need, and in scheduling the developmental events necessary to achieve operational status.

Although presented separately, these programs are interrelated. The technological expertise of the communications specialists is available to those concerned with the substance of toxicology. The program elements identified for implementation in 1971 are firm, but the rate of development in the subsequent years requires actions by communication organizations independent of the NLM. The wide-band dial service (WDS) of AT&T, for example, currently links only Washington, New York, Chicago and Los Angeles, though plans to expand the circuits have been formulated. In effect the NLM plans to exploit opportunities arising in both Federal and non-Federal sectors to the advantage of its biomedical clientele. The budgetary forecast is consistent with the advice obtained from the most knowledgeable leaders in communications science and technology.

BIOMEDICAL COMMUNICATIONS NETWORK

In carrying out its assigned responsibility for applying technology to the improvement of biomedical communications, the Lister Hill Center has formulated a comprehensive, practical program to serve as an overall framework within which both Federal and non-Federal health sciences communications activities can be integrated, coordinated, focused and magnified for maximum beneficial impact on the delivery of health care services. The program is expressed in terms of a nationwide Biomedical Communications Network (BCN) with provisions for accommodating an innovative technology exploitation program, allowing early interconnecting of local and regional communications facilities into a prototype network for test and evaluation, and permitting the ultimate development of an extensive information network comprised of advanced computer and telecommunications equipment and techniques linking major health care facilities, medical education centers, information repositories, and health professionals.

The Biomedical Communications Network (BCN) is a framework for cooperative shared development of improved communications and information capabilities. The Lister Hill Center, providing centralized network planning and coordination services, is using the BCN conceptual design to

identify the specific areas where systems development is needed; to encourage and guide local and regional developments; and to provide the means for interconnecting local projects into an expanding network of mutually supporting systems. The network concept has been selected for use in the biomedical community because the community's general level of systems development is sufficiently high to cope with the complexities of networking, and because the network provides the kind of point-to-point and interpersonal communications which the community needs so urgently. The network mechanism is precisely suited to linking together a medical community that consists of some 300,000 physicians, 7,000 hospitals, 100 medical schools, and numerous medical libraries, specialized information centers and other health science facilities.

Program elements provide for:

1. Communications for undergraduate and postgraduate health education

National requirements for increased health manpower in fields where professional and technical knowledge is advancing so rapidly have placed heavy burdens on educational institutions. The time available for information transfer is being severely compressed. Therefore medical educators are using new techniques to transfer information basic to the educational process.

The experimental phases of audiovisual instruction, of computer-aided instruction are now well developed. There is need for a national delivery system to insure that educational resources developed at one school can be shared with others, and to promote the technical compatibility which will make this possible.

2. Communications for continuing education

The applications gap between newly discovered knowledge and its utilization for improved diagnosis and patient care has been a matter of increasing national concern. The report of the President's Commission on Heart Disease, Cancer and Stroke, the Regional Medical Programs established by subsequent legislation, the Comprehensive Health Programs developed with state cooperation have the need to provide continuing education opportunities to the practicing physician as a common theme.

The BCN is conceptualized as a delivery system, independent of geographic restriction, to deliver informational materials to the foci of continuing education: universities, community hospitals, medical offices and clinics.

3. Communications for research

Research workers have continuous need for information from any place in the world bearing on what has been done before and what is now being done to provide leads they can follow in their own work, data they can utilize or check against, results requiring further verification.

The Library's existing programs are directed to increase the availability of such information to researchers. However, the libraries and information centers have economic limitations on their growth, and local access to limited, geographically dependent libraries, even though fortified by interlibrary loans, cannot provide the scientist prompt access to the world of information he needs.

It is the purpose of the BCN to develop interconnections among local and regional information resources, including the NLM itself, and to create a prototype communications network which would permit scientists, wherever located, to gain access to any information stored in any unit of the network. Through its Remote Information Systems Center (RISC), the Library is currently demonstrating how information stored in remote time-sharing computers can be searched by users. The Library Services Component of the BCN would provide this type of interlinkage for published information, the Specialized Information Services Component for other relevant data.

Priorities among program objectives and target groups have been reviewed y the NLM Board of Regents. The implementation of the BCN has been studied r depth and documented by

1) A Technical Development Plan

2) A Management Process Plan

3) A Financial Management Plan

The work of completing the detailed design of the BCN and carrying out h development of network components is already underway. The Lister Hill nter has already served as a rallying point for a wide variety of Federal l private organizations interested in improving biomedical communications. l Center has both formal and informal arrangements with medical groups, ucational associations, contractors, and recognized leaders in the medical eld, to get information and guidance for use in building the BCN. In fect, a strong partnership for progress is being formed between the ster Hill Center, other Federal activities, and a growing number of organizations from the private sector. The Center is also bringing together some very gh caliber industrial teams to work toward achieving the BCN. It has sponred a conference on Communications for Medical Education and Research ecember 1968), and a second on Potential Education Services from a National omedical Communications Network (February 1969). It has contracted with e Council of Academic Societies of the Association of American Medical lleges to assist in the development of substantive materials.

The schedule of events for developing the BCN over the fiscal years '71- 5 follows:

Fiscal Year 1971

1. Development of a Referral Center for the BCN starting in FY '71 to provide a national focal point for access to biomedical information and educational sources and resources. The Center would be staffed twenty-four hours a day and, on the basis of assembled information on biomedical information and education sources, it would route users to appropriate organizations or networks anywhere in the country.

2. Continued development and extension of bibliographic access to the medical literature by providing remote access to available systems through the TWX network and eventually direct access to MEDLARS II. The extension of available services to the TWX network would allow over one hundred libraries to have an immediate access, query capability for recent medical literature.

3. To parallel this, development of demonstration capabilities for facsimile delivery of medical literature using the wide-band dial service (WDS) of AT&T. Initially, this service will be established with other elements of the NIH for research and then with a Federal hospital or medical center such as the Veterans Administration or the National Naval Medical Center for support in patient care problems. It will then be extended to the Regional Medical Libraries in New York, Chicago, and Los Angeles to provide more dispersed, decentralized access to the holdings of the NLM.

4. Establishment in FY '71 of a national dial-access service to provide 4-6 minute lectures to health professionals on specific patient management problems similar to the services now provided by the University of Wisconsin. This service has been sufficiently successful to be extended to South Dakota and Minnesota. Analysis indicates that a single center can perform the function for the whole country much more economically than can multiple centers. The system cost studies suggest that such a center should develop in the Middle West. The demand for services was extrapolated from the physician use experience in Wisconsin; nurses will be provided access to the system starting in FY '72.

Fiscal Years 1972-1975

1. Development of a national continuing and undergraduate medical education network relying primarily on the broadcast of exchanged video-tapes and other audiovisual materials, but also experimenting with real-time internetting of medical schools and medical networks. In the initial year only limited experimentation would be possible. Ultimately experimentation would include internetting of existing networks in New York, Washington, Atlanta, Houston, and California

for special programs, internetting of selected medical schools for special educational programs with one-way video and two-way voice communication for question, and experimental use of EVR equipment.

2. Continued development of the capability of the Lister Hill Center to apply information technology to improve biomedical communications; to plan the further development of the Biomedical Communications Network; to conduct analyses and studies to define user needs and requirements; and to focus and coordinate, where necessary, the medical networking projects and programs of the Department.

TOXICOLOGY INFORMATION PROGRAM

It is in the area of interaction between chemical and biological systems nd more specifically in toxicology and pharmacology that disparity between he accumulation of information and its adequate retrieval and communica-ion is most apparent at present.

The goal of the Toxicology Information Program at the National Library f Medicine is:

> Through a network of information services, to provide information relating to the harmful effects of chemical compounds on humans promptly and efficiently for the professional communities concerned.

Program objectives the Toxicology Information Program realistically iopes to achieve are:

1. Identification of information requirements among responsible groups concerned with toxicology.

2. Identification of resources with competence in toxicology.

3. Development of professionally approved terminology to improve the organization, management and utilization of information in toxicology.

4. Development of a network of information centers in toxicology to improve accessibility and utilization of information in this subject area.

5. Construction of a computer-based system utilizing the available information from this network and ancillary information sources.

The following activities and targets are planned for the Fiscal Years 1971-1975:

FY '71

- Identify existing information sources.
- Begin development of toxicological file.
- Develop terminology.

FY '72

- Continue identification and evaluation and make known toxicology information and sources through a referral service.
- Develop toxicological information file.
- Develop professionally approved terminology to improve the handling of information in toxicology.

FY '73

- Further develop toxicological information file.
- Plan for a network of information centers in toxicology.

FY '74

- Develop a network of information centers in toxicology.
- Establish a computer-based National Toxicological Information System.

FY '75

- Fully operational National Toxicological Information System with an intricate network of information centers.

The alternative program level requirement would defeat the concept of the President's Science Advisory Committee report upon which this program is based. The Toxicology Information Program would be relegated primarily to: (1) development of a computerized chemical file and the conducting of retrieval experiments with the hope of providing limited availability of information and services to toxicological users, and (2) the identification of existing toxicological information sources. Depth of coverage of sources both within the Federal Government and outside the Federal Government will depend ultimately on the resources made available to the Toxicology Information Program.

IV. B. PROGRAM REQUIREMENTS

ALTERNATIVE PROGRAM LEVELS

Tables II - XVI display the estimated program output necessary to achieve the realistic objectives set forth above and the proportion of the identifiable need met by this output. They also portray program output at a constant FY 1970 level accounting for growth in demand for NLM services and include such adjustments as would be necessary during the five-year period as seen in today's perspective.

TABLE II

GRANTS FOR TRAINING IN MEDICAL LIBRARY SCIENCE AND HEALTH COMMUNICATIONS

	National Need 1/	Realistic Objectives		'70 Level Program Output	
			%		%
1971	1,600	200	13	100	6
1972	1,600	300	19	100	6
1973	1,600	400	25	100	6
1974	1,600	500	31	100	6
1975	1,600	500	31	100	6
Total	8,000	1,900	23	500	6

1/ Number of trainee man-years. The five-year total of 1,900 man-years under the realistic plan represents the training of 1,273 individuals. The total of 500 man-years under the level plan represents the training of 335 individuals.

The objective of the Training Grant Program is to encourage and assist the training of medical librarians and other health communications specialists required for the effective organization and dissemination of health knowledge.

Current estimates indicate that each of the approximately 100 medical schools require an average of 10 professionally trained staff, and about 1,000 other health related professional schools require at least one librarian. In addition, the 7,200 accredited hospitals in the United States report having only 600 certified librarians. Other new and urgent needs exist for health communications specialists in government agencies, research centers, and regional health systems.

TABLE III

ASSISTANCE TO SPECIALIZED SCIENTIFIC PROJECTS

	National Need	Realistic Objectives	%	'70 Level Program Output	%
1971	Unknown	15 1/	...	3	...
1972	"	15	...	3	...
1973	"	15	...	3	...
1974	"	15	...	3	...
1975	"	15	...	3	...
Total	"	75	...	15	...

1/ Number of projects

The objective of this program is to increase the effective dissemination and utilization of medical knowledge by enabling senior health professionals to devote full-time effort to scholarly projects of analysis, evaluation, and synthesis on major scientific, social, legal, and cultural concerns related to health education, research, and service.

Since the nation's programs and goals in many areas including health care, health education, and health research are changing and will continue to change, it is most important to encourage and support careful studies of the highest quality to determine what is happening, to weigh the results, both positive and negative of such programs, and to attempt projections for the future.

TABLE IV

RESEARCH AND DEVELOPMENT IN MEDICAL LIBRARY SCIENCE AND RELATED FIELDS

	National Need	Realistic Objectives 1/			'70 Level Program Output 1/		
		Research	Demonstration	%	Research	Demonstration	%
191	Unknown	20	2	..	34	0	..
192	"	20	2	..	34	0	..
193	"	20	2	..	34	0	..
194	"	20	2	..	34	0	..
195	"	20	2	..	34	0	..
Total	Unknown	100	10	..	170	0	..

1/ Number of projects

Te objective of this program is to provide assistance for research and dvelopment projects in medical library science and related fields.

Frther investigation is needed in such areas as: attitudes and behavior o health information seekers; rules of language in the biomedical fields; iproved information systems; and development and testing of various iformation media. Projects supported will draw on the shared experience of ltidisciplinary teams.

In research demonstration projects would be supported under the realistic lvel. Five of these projects would be library related, and would probably ve to do with improved systems for delivering information quickly to the int of use. Such projects would be especially important for the developing twork of regional medical libraries and regional medical programs. The five maining demonstration projects would probably include information systems signed to enhance the effectiveness of learning resource centers in dividual hospitals.

ie demonstration projects are more valuable but also more costly than research ojects. This factor accounts for the fact that the realistic level projects wer total grants at a greater cost than the level output projection.

TABLE V

GRANTS TO IMPROVE BASIC MEDICAL LIBRARY RESOURCES

	National Need	Realistic Objectives 1/	%	'70 Level Program Output 1/	%
1971	470	470	100	424	90
1972	480	480	100	424	88
1973	510	510	100	424	83
1974	525	525	100	424	81
1975	540	540	100	424	78
Total	2,525	2,525	100	2,120	84

1/ Annual objectives are expressed as the total number of institutions supported by an award in the year. An institution receiving an initial-year award is eligible to apply for continuation awards for four successive years so that the total number of institutions benefiting from resource grants in the 1971-1975 period is less than the number of annual awards. The 2,525 annual awards projected in the realistic objective plan would benefit approximately 965 separate institutions. The 2,120 annual awards projected in the level output plan would benefit an estimated 849 separate institutions.

The objective of this program is to assist public and private non-profit medical libraries in establishing, expanding, and improving basic medical library or related resources.

This program will not attempt to meet the total needs of U. S. health libraries; in 1965 it was estimated that over $100,000,000 would be required to bring health science libraries up to recommended strength. Grants made under the Medical Library Assistance Act to date have enabled the NLM to gain experience and test concepts. It is proposed that the program be expanded significantly with broadened emphasis to include more concern for the nature of services rendered and the use of advanced information techniques and equipment. Of course the basic aim will remain to assist libraries in expanding their basic resource materials and attaining adequate staff levels.

TABLE VI

GRANTS TO ESTABLISH AND SUPPORT REGIONAL MEDICAL LIBRARIES

	National Needs	Realistic Objectives 1/	%	'70 Level Program Output 1/	%
'71	11	11	100	9	80
'72	13	13	100	9	70
'73	15	15	100	9	60
'74	17	17	100	9	53
'75	17	17	100	9	53

1/ Annual objectives are expressed as the total number of institutions
upported in the year. Libraries designated to serve as Regional Medical
ibraries will receive continuation awards in successive years so that
he total number of institutions benefiting will be 17 (realistic objective)
r 9 (level output plan).

---

e objective of this program is to develop a system of regional medical
braries with sufficient resources to supplement the services of other
dical libraries within the regions served.

ch of the nine regional medical libraries currently supported will be
quired to provide services for a relatively large portion of the
tion's health manpower for a large geographic area. We propose to expand
e number of regional centers in order to permit closer relationships
tween the individual center and other libraries and users in the region.

TABLE VII

GRANTS TO SUPPORT BIOMEDICAL SCIENTIFIC PUBLICATIONS

	National Needs	Realistic Objectives	%	'70 Level Program Output	%
1971	Unknown	25 1/	...	13	...
1972	"	35	...	13	...
1973	"	45	...	13	...
1974	"	55	...	13	...
1975	"	60	...	13	...
Total	Unknown	220		65	...

1/ Annual objectives represent the number of publication projects supported in the year. However, a specific project may be supported for more than one year so that the total number of distinct publications supported would be less than the total awards of 220 (realistic plan) or 65 (level output plan).

The purpose of this program is to assist in the preparation, production, and dissemination of biomedical scientific publications of a non-profit nature.

Over 25,000 articles totaling 5,000,000 pages are published in 40 languages in some 14,000 biomedical journals each year.

In addition to translation needs for the foreign language articles, this volume of literature is largely unavailable to America's three to four million health workers simply because of its immense volume except to the degree that it can be abstracted or referenced in secondary publications. Despite the wide need for translations and secondary information tools in medical libraries, the high preparation costs and low sales volume preclude total self-sufficiency for such undertakings. In the past ten years the cost of medical periodicals has almost doubled; costs of medical books have risen over fifty percent. This grant program supports publication of both translations and secondary works to make this valuable information available to the professionals who need it.

TABLE VIII

INTERLIBRARY LOAN REQUESTS

	National 1/ Need	Realistic Objectives	%	'70 Level Program Output	%
'71	500,000	400,000	80	300,000	60
'72	500,000	450,000	90	300,000	60
'73	500,000	500,000	100	300,000	60
'74	400,000	400,000	100	300,000	75
'75	350,000	350,000	100	300,000	86
Totals	2,250,000	2,100,000	94	1,500,000	66

1/ These figures presume growing investments by NLM in building medical library collections at the local level. The improvement of the collections should temper and finally decrease the national requirement for loans from the network libraries. Without growing investments in improving local library collections the national requirements for loans from the NLM network will grow at a rate impossible to forecast.

ıder the interlibrary loan service the NLM and the regional medical libraries rovide photocopies of health literature to local libraries on request. The erm interlibrary loan is misleading. When the request is for an article or hapter of a book the requestor is provided with a photocopy which he may eep. An increasing volume of the workload is being shifted to a network of egional medical libraries who are supported by the NLM to serve users within heir area.

TABLE IX

MEDLARS SEARCHES

	National Needs	Realistic Objectives: Retrospective one-time searches	Realistic Objectives: Recurring searches for individuals	%	'70 Level Program Output: Retrospective one-time searches	'70 Level Program Output: Recurring searches for individuals	%
91	Unknown	20,000	5,000	...	12,000	3,000	...
92	"	24,000	8,500	...	9,000	6,000	...
93	"	28,000	11,000	...	8,000	7,000	...
94	"	30,000	16,000	...	7,500	7,500	...
95	"	30,000	18,000	...	7,500	7,500	...
otal	Unknown	132,000	58,500	...	44,000	31,000	...

eand searches are special listings of bibliographic citations prepared upon euest from the computer-based file of citations to medical literature. These erches enable the specialist to obtain listings on a narrowly defined subject s for example, cardiac resuscitation.

TABLE X

GENERAL BIOMEDICAL INDEXES FOR NATIONAL USE:
PAGES OF PUBLICATIONS ISSUED

	National Needs	Realistic Objectives	%	'70 Level Program Output	%
71	40,000 1/	40,000	100	34,000 2/	85
72	38,000	38,000	100	34,000	90
73	40,000 3/	40,000	100	34,000	85
74	40,000	40,000	100	34,000	85
75	40,000	40,000	100	34,000	85
Total	198,000	198,000	100	170,000	86

/ Includes 5-year cumulation of _Current Catalog_
/ Does not include 5-year cumulation of _Current Catalog_
/ The need for general indexes should not increase beyond this level. At this point we should turn to other strategies for meeting this demand such as revised publication patterns and/or increased emphasis on recurring specialized bibliographies or recurring demand searches.

his projection includes the monthly and annual (cumulated) _Index Medicus_, and he bi-weekly and quarterly (cumulated) _Current Catalog_. _Index Medicus_ is the omprehensive index to the world's biomedical literature. _Current Catalog_ ncludes cataloging information on all new biomedical volumes acquired by he NLM. References in both of these indexes are arranged by controlled edical vocabulary. These two indexes permit the health specialist to keep breast of the large volume of new medical publications.

TABLE XI

RECURRING BIBLIOGRAPHIES AND LITERATURE SEARCHES:
PAGES OF PUBLICATIONS ISSUED

	National Need	Realistic Objectives	%	'70 Level Program Output	%
971	55,000	32,000	60	24,000	44
972	55,000	38,000	70	24,000	44
973	55,000	45,000	80	24,000	44
974	55,000	50,000	90	24,000	44
975	55,000	55,000	100	24,000	44
Total	275,000	220,000	80	120,000	44

'his projection relates to recurring bibliographies on specialized medical ;ubjects as, for example, the Index to Dental Literature, and to published .iterature searches on specific topics of substantial interest. At present, :1 recurring bibliographies are being published. As medical research expands .nto new fields, it is anticipated that the number will increase to ıpproximately 50 in 1975.

TABLE XII

TOOLS FOR THE USE OF BIOMEDICAL INFORMATION SPECIALISTS:
PAGES OF PUBLICATIONS ISSUED

	National Need	Realistic Objectives	%	'70 Level Program Output	%
)71	35,000	28,000	80	20,000	60
)72	35,000	33,000	94	20,000	60
)73	40,000	35,000	87	20,000	50
)74	45,000	35,000	80	20,000	44
)75	50,000	35,000	70	20,000	40
Total	205,000	166,000	81	100,000	49

1ese projections relate to the Union Lists of Serials, Union Catalogs of ooks, and catalog card sets. These materials furnish the user with specific nformation on the holdings of the NLM, as for example, available journal eries.

TABLE XIII

HEALTH AND AUDIOVISUAL PRODUCTION

	National Need 1/	Realistic Objectives	%	'70 Level Program Output	%
1971	1,000	600	60	300	30
1972	1,500	600	40	300	20
1973	2,000	600	30	300	15
1974	2,500	600	24	300	12
1975	3,000	600	20	300	10
Total	10,000	3,000	30	1,500	15

1/ Not met by other sources

The National Medical Audiovisual Center produces and duplicates biomedical television tapes, motion pictures, filmstrips, slide series, and audiotapes in conjunction with its audiovisual loan distribution and sales programs.

TABLE XIV

HEALTH AUDIOVISUAL DISTRIBUTION

	National Need 1/	Realistic Objectives	%	'70 Level Program Output	%
191	150,000	150,000	100	100,000	66
192	200,000	200,000	100	100,000	50
193	250,000	250,000	100	100,000	40
194	300,000	300,000	100	100,000	33
195	400,000	400,000	100	100,000	25
Total	1,300,000	1,300,000	100	500,000	38

1/ Not met by other sources

The aim of this program is to meet unfilled audiovisual needs in health professional curriculums and general health information programs by providing loans of audiovisuals to schools, health agencies, hospitals, and other users. The National Medical Audiovisual Center serves as the Public Health Service clearinghouse for the loan of audiovisuals.

TABLE XV

HEALTH AUDIOVISUAL SURVEYS, SEMINARS, AND WORKSHOPS

	National Need	Realistic Objectives	%	'70 Level Program Output	%
171	100	50	50	50	50
172	125	65	52	50	40
173	150	80	53	50	33
174	200	95	48	50	25
175	250	110	44	50	20
Totals	825	400	48	250	30

The National Medical Audiovisual Center conducts surveys, seminars, and workshops to provide guidance to health educational institutions on the role of audiovisuals in effective teaching. This guidance extends to suggested audiovisuals for specific courses, types and uses of equipment, and physical facilities.

TABLE XVI

GRANTS TO ASSIST IN THE CONSTRUCTION OF MEDICAL LIBRARY FACILITIES

	National Needs	Realistic Objectives 1/	%	'70 Level Program Output 2/	%
'71	589	25	4	...	...
'72	564	50	9	...	...
'73	514	60	12	...	...
'74	454	70	15	...	...
'75	384	80	21	...	...

1/ Realistic Objectives are expressed as the projected number of construction projects funded

2/ No construction projects are projected in the Level Output Plan because no appropriations are requested for FY 1970

Construction grants are awarded to medical schools, hospitals, and other academic and non-academic health science institutions to assist in the construction of new, and the renovation, expansion, or rehabilitation of existing medical library facilities. This program provides grants for up to 75% of the cost of construction of medical library facilities for public or private non-profit institutions.

The legislative authority for this program is contained in the Medical Library Assistance Act but the appropriation will be made by the Division of Educational and Research Facilities of NIH. These appropriations are not reflected in the Five-Year Budget Projections for the National Library of Medicine on the following pages. The output figures above relate to projected appropriations of $25,000,000 in each of the five years by the Division of Educational and Research Facilities.

Although the projected appropriation level remains constant, the annual number of projects funded increases as we move from 1971 to 1975 because relatively small projects will be funded in the later years.

C. BUDGET PROJECTION

REALISTIC LEVEL
(Program category 241300 = Medical Libraries and Biomedical Communications Programs)

Five-year Plan in Thousands

	1970 Base	1971	1972	1973	1974	1975
ats						
Taining	983	2,000	3,000	4,000	5,000	5,000
Secial scientific projects	5	500	500	500	500	500
search	990	5,000	5,000	5,000	5,000	5,000
sources	2,105	8,700	8,900	9,400	9,700	10,000
gional medical libraries	2,142	5,200	6,100	7,000	8,000	8,000
blications	267	1,000	1,500	1,900	2,300	2,500
Subtotal	6,492	22,400	25,000	27,800	30,500	31,000
ct Operations						
brary operations	7,193	9,200	9,800	10,900	11,900	13,000
xicology	1,528	2,300	3,000	4,000	5,000	6,000
AC	2,129	3,500	4,000	4,500	5,000	5,500
NCBC	898	3,300	7,300	10,500	12,700	13,900
eview and approval	594	1,200	1,200	1,400	1,500	1,600
rogram direction	1,548	1,700	1,800	1,900	2,000	2,100
Subtotal	13,890	21,200	27,100	33,200	38,100	42,100
al	20,382	43,600	52,100	61,000	68,600	73,100

V. C. BUDGET PROJECTION

ALTERNATIVE LEVEL
(Program category 241300 = Medical Libraries and Biomedical Communications Programs)

Five-year Plan in Thousands

	1970 Base	1971	1972	1973	1974	1975
Grants						
Training.............	983	1,062	1,147	1,238	1,337	1,444
Special scientific projects...........	5	50	54	58	63	68
Research.............	990	1,069	1,155	1,247	1,347	1,455
Resources...........	2,105	2,273	2,455	2,652	2,864	3,093
Regional medical libraries.........	2,142	2,313	2,498	2,698	2,914	3,148
Publications........	267	288	311	336	363	392
Subtotal..........	6,492	7,055	7,620	8,229	8,888	9,600
Direct Operations						
Library operations..	7,193	7,768	8,389	9,060	9,785	10,568
Toxicology..........	1,528	1,650	1,782	1,924	2,078	2,245
NMAC	2,129	2,300	2,483	2,681	2,896	3,128
LHNCBC..............	898	970	1,047	1,131	1,222	1,319
Review and approval.	594	642	693	748	808	873
Program direction...	1,548	1,672	1,806	1,950	2,106	2,275
Subtotal	13,890	15,002	16,200	17,494	18,895	20,408
Total................	20,382	22,057	23,820	25,723	27,783	30,008

. D. LEGISLATION REQUIREMENTS

Authorizations contained in PL 89-291, the Medical Library Assistance tof 1965, now codified as Sec. 393-399 of Title III, Part I of the Public ath Service Act, expire June 30, 1970. Less than half of the total sums oided by the law will have been appropriated.

The NLM proposes that all authorities of the Medical Assistance Act of 6 be extended with these proposed modifications:

c 393.	CONSTRUCTION GRANTS:	(1)	Authority for land purchase with grant funds.
c 394.	TRAINING GRANTS AND FELLOWSHIPS:		No substantive changes.
c 395.	SPECIAL SCIENTIFIC PROJECTS:	(1)	Authority for grants to institutions as well as individuals.
c 396.	RESEARCH AND DEVELOPMENT GRANTS:	(1)	Authority to permit support of demonstration projects.
c 397.	MEDICAL LIBRARY RESOURCE GRANTS:	(1)	Authority for support of new collections.
		(2)	Restrictions on award level for first and subsequent years have been deleted.
c 398.	REGIONAL MEDICAL LIBRARY PROGRAM:	(1)	Authority to permit distribution of materials by grantee to cooperating libraries.
		(2)	Authority to permit use of contract mechanism for support.
		(3)	Authority to permit support of planning.
c 399.	BIOMEDICAL PUBLICATIONS:	(1)	Eligibility requirements for grants broadened to correspond with other programs.
		(2)	Three-year limitation on support of periodical publications has been deleted.

The proposed extension of the Medical Library Assistance Act was submitted he Congress on January 19, 1969, where it has been referred to the Committee abor and Public Welfare of the Senate, and the Committee on Interstate and ign Commerce of the House, respectively.

Extension of these authorities, with appropriate funding, will protect and nd the modest gains already made under this legislation and allow an expanded rt built on these pilot programs to help remedy the accumulated deficiencies ecades of neglect of the nation's health information needs.

APPENDIX I

NATIONAL LIBRARY OF MEDICINE

DIRECT CONSTRUCTION

Lister Hill National Center for Biomedical Communications

The present facility housing the NLM was designed in 1958 for a maximum staff of 250. The use of computerized systems for supporting so many of the Library's functions could not have been anticipated, nor could the rapid growth and expansion of its mission have been foreseen. Serious overcrowding has occurred, and some of the staff are housed in rented space. Stack space has been converted to other uses, but the growing biomedical literature will require its reconversion.

An architectural firm made feasibility studies of the Library's needs in 1967, 1968, and 1969, and recommended an annex of 91,000 net square feet at the southwest corner of the existing facility in Bethesda at a total cost of $12,000,000. Design, for which $900,000 is requested, will require 21 months, and construction, two years.

The new building will contain specialized space for laboratory research in communications technology and network engineering in addition to general office and conference. Space will be converted back to its original library use.

CONSTRUCTION OF FACILITIES FOR LISTER HILL NATIONAL CENTER FOR BIOMEDICAL COMMUNICATIONS, NATIONAL LIBRARY OF MEDICINE, 1971 - 1975 .... $ 12,000,000

Health Task Force

Objective Area: Increasing Knowledge

Program: Health Research Facilities Construction

SUMMARY

The national inventory of research facilities at any point in ime acts as an ultimate constraint on the amount of research and esearch training activity that can take place in the country. xpansion of the inventory involves an average lag of 3 years etween commitment of funds and availability of a new facility. An nstitution's plans for expanding facilities invariably are based on lanned expansion of specific research and research training activiies which the institution contemplates for one or more reasons: o attract more faculty to increase graduate training in the health ciences; to attract more faculty to expand training in the heatlh rofessions; and to undertake major new research (and training) rograms focussed on important problems (e.g., population control, nvironmental health, cardiovascular disease, aging, pharmacology-oxicology, etc.). Obviously, in planning for expanded research acilities, an institution does so with the expectation that funds o operate the programs, and personnel to do the research, will be vailable.

In the past 12 years, the NIH has supplied about one-third of he total funds used to construct biomedical research facilities n the country's non-profit, non-Federal institutions. This was lone through the Health Research Facilities Construction program, which ias been in continuous operation since FY 1957 and has awarded about 470 million in 50-50 matching grants to our 1150 projects. Over 50% of the national inventory of 41.5 million net square feet of health-elated research space has been constructed since 1957, with the HRF rogram supplying matching grants for about 62% of this amount. About 25% of the current space in use is in very poor condition and should be eplaced or remodelled. Moreover, many institutions with active esearch and research training programs are badly overcrowded: in ggregate they need 14.8 million net square feet of additional space--35% of the current inventory--to accommodate <u>current</u> programs properly. By 1980, the institutions now doing most of the biomedical research expect to almost double their research and research training activities and will need about 54 million net square feet of new space to accommodate all of the programs properly. These data are from the findings of a national survey of health research facilities which has just been completed.

The Realistic Level of HRF programs from FY 1971 through 1975 assumes research funds and personnel will grow at rates projected by the HRF survey respondents--that is, the number of people working in the laboratories would approximately double by 1980. (This is congruent with the projection of the Carnegie Commission on Higher Education.) On the assumption that the ratio of Federal to non-Federal funding for research facilities is the same in 1971-75 as it was from 1957-68--namely, about 31% Federal funds--the HRF appropriations would have to be as follows:

	FY 71	FY 72	FY 73	FY 74	FY 75
HRF Appropriation (millions of dollars)	120	127	141	148	160

If the Federal share of responsibility for funding research facilities were to increase to about 60% of the total cost, these budgets would have to be doubled.

The Alternative Level assumes the FY 1970 level of research and research training activities would remain constant and the role of the HRF program would be to eliminate current over-crowding and unsatisfactory space and maintain the inventory in satisfactory condition. Assuming a constant Federal to non-Federal participation ratio at the 1957-68 value, the funds required would be:

	FY 71	FY 72	FY 73	FY 74	FY 75
HRF Appropriation (millions of dollars)	44	47	50	52	58

If the ratio were to shift as above, these requirements would likewise double.

The authority for the HRF program expires in FY 1971. Authorization levels are $20 million for FY 1970 and $30 million for FY 1971. The President's budget for FY 1970 does not include any funds for the HRF program, although there is a backlog of approved--but unfunded--applications that will be almost $100 million by June 30, 1969. Legislative action will be needed in 1970 if the program is to be extended beyond FY 1971.

The possibility of a different mechanism for funding research facilities through a loan program may merit further study. However, insufficient time was available to undertake and complete such a study in time to meet the Task Force deadline.

HEALTH TASK FORCE

Objective Area: Increasing Knowledge
Program: Health Research Facilities Construction

I. Program Background
   A. Program Objectives
      1. Introduction and Summary of Program Objectives

Today's momentum in biomedical research originated in World War II and the postwar period. The space shortage became acute immediately after the war because the universities and colleges rapidly increased student enrollments, and space previously used for research was reassigned to teaching. Furthermore, the medical advances developed through research during the war increased the demand for expansion of biomedical research. To relieve this situation, Congress passed Public Law 84-835 in July 1956. This law authorized the Public Health Service to initiate a program of matching grants for construction of health research facilities. Implementation of the law was assigned to the National Institutes of Health and the program began at once.

Then, as now, the objectives of the program were to increase the space available for health related research in all areas of the Nation, and to improve the quality of the Nation's biomedical research environment. In meeting these objectives, awards of Federal funds for up to 50 percent of the cost of the facility have been utilized to encourage the construction renovation, and equipping of biomedical research laboratories.

Since the inception of the program in 1956, 1171 projects totaling $473 million have been awarded to 408 institutions in all 50 states, the District of Columbia and Puerto Rico for the construction of approximately 19 million net square feet of health-related research space. Approximately 80% of the space is now completed and in use throughout the country. Grantee institutions obtained and provided $630 million (57%) of the total $1.1 billion of construction cost. Upon completion of all the space awarded through FY 1969, about 90,000 professional, technical, trainee, and supportive personnel--about 45% of the total number working in non-Federal, non-profit biomedical research institutions--will work in the space. In the academic sector, the professional personnel are usually M.D. and Ph.D. faculty members who are engaged in both teaching and research activities in the health professional schools and elsewhere.

2. Summary of Authorizing Legislative Language, Expiration Date, Authorizing Levels

Upon review and approval by the National Advisory Council on Health Research Facilities of applications for the construction or remodeling of biomedical research facilities, the HRF Construction program, within the limits of funds available, may award up to 50% of the construction cost. In addition to expanding and upgrading the Nation's research facilities plant, the basic legislation proposes that the facilities '(a) will be used for research in disciplines or diseases which have the most urgent needs, (b) are adaptable to the various methods by which research is organized or advanced; (c) will be in institutions or localities with broad research programs and potentials; and or (d) will promote a better geographical distribution of research through assistance of established or promising new research activities in various areas of the Nation having at present relatively few such research facilities.' The Act extending the program for FY 1970 and 1971 (Health Manpower Act of 1968---P.L. 90-490) further provides that a more favorable Federal matching ratio of 66-2/3% be applicable to the construction of facilities determined by the Secretary to be of special national or regional significance. The Secretary is empowered to allocate up to 25% of appropriated funds for this purpose. This clause was added to the authorizing legislation to provide funds for such high priority programs as population research, environmental health research, etc.

The current legislation expires June 30, 1971. The authorization levels for FY 1970 and 1971 are $20 million and $30 million, respectively. The President's budget for FY 1970, however does not request any funds for the HRF program.

3. Quantified Outputs - FY 1968-1970

Levels of output in FY 1968-1970 are stated in terms of space and dollars of facilities awarded and completed, by types of institutions.

FY 1968-1970 outputs are summarized below:

Item	1968	1969	1970
Space awarded (thousands of net square feet)	1,105	534	0 a/
Space completed (thousands " " ")	1,102	137 b/	-- c/
HRF dollars awarded (millions)	$39.4	$21.3	$0 a/

a/ No funds are included in President's budget for FY 1970.
b/ Based on incomplete reporting; completed space estimated at approximately the 1968 level.
c/ Estimated at approximately the 1968 level.

Of the 1,105,000 net square feet awarded in FY 1968, 78,000 was awarded for remodeling and modernizing facilities; the remainder consisted of new construction. In 1969, 48,000 of the 534,000 net square feet awarded was for remodeling and modernizing; the remainder, for new construction.

Based on a study of some 150 awards, it is estimated that about 85% of all construction and remodeling awarded increases the physical capacity for research; the reamining 15% consists of remodeling, modernizing, and replacement of obsolete space.

Approximately 38%, or 424,000 net square feet, was awarded to public institutions in 1968; 65%, or 681,000 net square feet, to private institutions. Approximately 59%, or 315,000 net square feet was awarded to public institutions in 1969; 41%, or 219,000 net square feet, to private institutions.

Details of space and dollars awarded and completed by type of institution and by geographical area, are, are provided on Tables 1, 2, 3 and 4.

4. Relationship of Objectives to PPB Structure

The Department's PPB structure reflects the major objectives of the NIH programs. One of the goals especially emphasized within the Research Facilities and Resources program is support of Health Research Facilities.

PPB Program Structure

2	Improving Health
21	Development of Health Resources
211C	Research Facilities and Resources
211C2	Special Emphasis Programs
211C22	Health Research Facilities

5. Program's Attempt at Prevention Rather than Treatment of Social Programs.

The HRF Construction program, in providing facilities for research into the sciences related to human health, indirectly assists in the prevention or amelioration of social problems through a broadening of basic knowledge and a direct war against the diseases besetting all mankind. In addition to traditional research and research training into specific diseases--such as cardiovascular, cancer or metabolic diseases--the HRF program provides facilities in which "preventive" research is conducted, such as research on population, aging, children's diseases, congenital problems, mental retardation, etc.

Table 1. Health Research Facility Awards FY 1957-1969

Institution	Number of Projects	HRF Dollars Awarded (millions)	%	Net Square Feet Awarded (millions)
Total	1,171	$473.2	100	18.9
Academic	836	381.9	81	15.1
Dental Schools	26	9.4	2	.4
Medical Schools	374	266.0	56	9.4
Schools of Pharmacy	23	5.0	1	.3
Schools of Public Health	11	9.7	2	.3
Schools of Veterinary Medicine	35	9.7	2	.5
Other	367	82.1	17	4.2
Non-Academic	355	91.3	19	4.0
Hospitals	228	65.0	14	2.6
Research Institutions	64	18.5	4	.9
Other	43	7.8	2	.5

Table 2. Dollars Awarded by Types of Institutions, FY 1968-1970
(In millions of dollars)

Institutions	1968	1969	1970 a/
Total	$39.4	$21.3	$ 0
Academic	32.9	18.8	0
Medical Schools	29.9	14.9	...
Dental Schools	b/	...	...
Schools of Pharmacy	...	...	...
Schools of Public Health	...	...	...
Schools of Veterinary Medicine	b/	.6	...
Others	2.9	3.3	...
Non-Academic	6.5	2.5	0
Hospitals	3.4	2.5	...
Research Institutions	2.7	...	...
Others	.4	...	...

a/ No funds included in President's budget for FY 1970.

b/ Less than $100,000.

Table 3. Net Square Feet Awarded, by Type of Institution, FY 1968-1970
Health Research Facilities Construction Program
(In thousands of square feet)

Institutions	1968	1969	1970 a/
otal	1,104.7	534.3	0
cademic	943.4	465.3	0
edical Schools	860.4	328.7	...
ental Schools	...	...	...
chools of Pharmacy	...	...	...
chools of Public Health	...	...	...
chools of Veterinary Medicine	...	18.8	...
ther	83.0	117.8	...
on-Academic	161.3	69.0	0
ospitals	73.5	69.0	...
esearch Institutions	75.2	...	...
ther	12.6	...	...

a/ No funds included in President's budget for FY 1970.

able 4. Net Square Feet Completed, by Type of Institution, FY 1968-1970
Health Research Facilities Construction Program
(In thousands of square feet)

Institutions	1968	1969 a/	1970 b/
Tal	1,002.0	136.5	
Aademic	818.9	120.9	
Mdical Schools	513.1	21.3	
Dntal Schools	22.9	...	
Shools of Pharmacy	14.1	...	
Shools of Public Health	...	...	
Shools of Veterinary Medicine	5.7	41.7	
Oher	263.3	57.9	
Nn-Academic	181.1	15.6	
Hspitals	154.0	15.6	
Rsearch Institutions	29.1	...	
Oher	...	...	

/ Based on incomplete reporting. Total completions are estimated at approximately the 1968 level.

/ Data estimated at approximately the 1968 level.

Table 5. Net Square Feet and Dollars Awarded and Completed, by Geographical Area FY 1968-1970
(In thousands of nsf and millions of dollars)

Census Bureau Division	nsf Awarded			nsf Completed			HRF Dollars Awarded		
	1968	1969	1970[a/]	1968	1969[b/]	1970[c/]	1968	1969	1970[a/]
Total U.S.	1,105	534	0	1,002	137	1,000	$39.4	$21.3	0
New England	89	117	...	58	...	...	4.4	5.3	...
Middle Atlantic	468	119	...	261	22	...	18.1	4.4	...
East North Central	99	73	...	144	31	...	3.1	3.1	...
West North Central	80	...	...	151	5	...	2.6	...	...
South Atlantic	191	79	...	45	...	...	5.4	3.6	...
East South Central	20	58	...	3	3	...	.3	2.3	...
West South Central	59	...	...	31	65	...	2.1	...	...
Mountain	21	50	...	241	10	...	.6	1.4	...
Pacific	77	39	...	69	...	...	2.7	1.2	...

a/ No funds included in President's budget for FY 1970.

b/ Based on incomplete reporting. Total completions estimated at approximately the 1968 level.

c/ Data estimated at approximately the 1968 level.

B. Program Operations

1. Basic Rationale for Federal Role

The basic rationale for the Federal Government role in health research facilities construction is essentially contained in the rationale for the Federal role in support of biomedical research: national goals in advancing scientific knowledge in this area may be achieved only at great cost; the risks of failure are high; high levels of expenditure must be sustained for long periods of time; and the payoffs tend to be universal--rather than purely local--in their applicability. Only the Federal Government can command the resources needed to sustain these activities at a level and in a way that will ensure achievement of the national goals. State and local governments simply cannot do more than supply a portion of the necessary funds.

2. Involvement of State and Local Governments

Since the research facilities program is a matching grant program, there is a substantial requirement for state and local funds. For example, the sources of funding for on-going construction and remodeling is as follows:

Institutions' unrestricted funds	9.3%
Institutional borrowing	2.1%
Private funds earmarked for construction	9.1%
Construction funds from state and local governments	47.1%
Federal funds	31.2%
Other sources	1.2%
	100.0%

Thus, state and local governments have, in fact, been supplying a larger portionthan has the Federal Government.

Whether this will continue to be true in the future is not clear. The respondents to the Health Research Facilities Survey are pessiristic on this point: they believe that only 42% of construction funds needed to meet their estimated 1980 facilities needs will be obtainable from non-Federal sources. Recently, there have been evidences of serious problems facing state governments in providing facilities funds for state universities. In California, for example, the voters rejected a bond issue last fall which was intended for higher education facilities. Matching money for a number of HRF projects was to be derived from this bond issue.

3. Present Role of Non-Governmental Participation

Private sources of funding have been providing--according to the table above--about 10% of the funds for research facilities. In certain areas and for certain projects this can be a significant factor. For example, the Ford Foundation has committed substantial sums to match Federal grants for research facilities for studies in reproductive biology and other areas related to population control. (One such project--which was reviewed and approved with a high priority by the National Advisory Council on Health Research Facilities in April 1968--cannot be initiated because there were insufficient funds available in FY 1969 and no HRF funds requested for FY 1970. The decisions by the Department and the BoB to increase NIH funding in FY 1970 for research on population problems, on the one hand, and not to request funds for research facilities, on the other, do not appear to be consistent.) Also, the National Retired Teachers Association and the American Association of Retired Persons have committed funds to match an HRF grant for an Institute for Research on Aging to be built at the University of Southern California. (The application for this project is currently being reviewed.)

4, 5. Not applicable

6. Can Federal Participation be Phased Out

According to the HRF survey respondents, the role of Federal funds for facilities will have to be substantially greater in the future than it has been in the past. They expect the non-Federal portion to decline from 69% to 42% of total construction costs.

C. Evidence that Objectives are being Served by Program

In a braod sense, the accomplishments of the biomedical research community are the prime evidence of effectiveness. A resolution passed by the National Advisory Council on Health Research Facilities on March 27, 1969, contains the following passage:

> Since its inception in 1957, the NIH, through the HRF program, has participated in the cost of more than one-half of the new health-related research space constructed. This space was an essential component of the efforts that have brought into being medical research programs which have made the United States a world leader in this sphere

> of human activity. The practical consequences of this research have included such advances in the diagnosis and treatment of disease as electronic devices for the control of heart attacks, chronic dialysis for kidney failure, kidney transplantation, open heart surgery, drug therapy for leukemia, Hodgkins disease and some kinds of cancer, the almost complete prevention of polio, measles and other infectious diseases, etc. As a result of these advances, millions of our citizens enjoy longer, more productive and more self-fulfilling lives. (A copy of the resolution is attached to this paper.)

A statistical analysis of the health research facilities inventory, accomplishments and needs is contained in the attached report of the HRF Survey conducted for NIH by Westat Research, Inc. The survey sought information from all non-Federal non-profit institutions conducting biomedical research.

Questionnaires were mailed to 1093 institutions about September 1, 1968. Although only 83.3% of the addressees responded, they account for 96.6% of the dollar value of all PHS research grants awarded in Fiscal Year 1967. In effect, the respondents comprise almost all of the facilities throughout the country where health-related research is conducted.

The respondents use 41.5 million net square feet of HR space, of which 38.2 million is owned by the users, 2.1 million owned by other institutions (mainly hospitals affiliated with medical schools), and 1.2 million is rented. Medical schools use 42% of the space, other health professional schools, 8% and other academic institutions, 32%. Of the space owned by respondents, 9.5 million net square feet (about 25%) was built prior to 1940, 7.7 million (55%) was built since 1956. Thus, slightly over half of the space is relatively new; slightly under half is relatively old.

The respondents report that 10.2 million net square feet or 27% of space currently in use is in unsatisfactory condition: 6.5 million should be remodeled, and 3.7 million should be replaced. The respondents also report they require 14.8 million net square feet of additional space to relieve overcrowding of current programs. Thus, about 25 million nsf of new and remodeled space is needed to correct current deficiencies impeding more efficient, effective research.

Construction currently in process or fully funded consists of 8.6 million nsf of new construction and 1.5 million nsf of remodeling. By 1980, respondents estimate their projected needs for additional space (12 years from reporting date) at 54 million net square feet of new space and 17 million nsf of remodeling. This includes the 25 million nsf of new construction and remodeling needed to overcome current deficiencies.

Of the estimated 12-year cost of construction ($3.4 billion) and remodeling ($.6 billion), respondents estimate that only between 38% and 42% of the needed funds could be met through non-Federal assistance.

2. Monitoring and Evaluation of Program Performance

The HRF Act requires that space built with HRF grants be used for HR research for at least 10 years after construction. The HRF program periodically obtains certifications (at the 3rd, 7th and 10th years following initial use of the space) from grantees as to the proper use of the space. Thus far, no significant problems have been uncovered.

3. Should HRF Program be Consolidated with Similar Programs Within or Outside of DHEW?

NIH is the Federal Government's primary supporter of HR research in the non-profit, non-Federal sector--$888 million in FY 1969, or 67% of the estimated health research effort. Since research facilities are so closely related to research programs, it is essential that the planning and administration of research facility support be closely coupled to the planning and administration of research and research training programs. Consolidation of this program with other construction programs administered outside of NIH would make the primary coordination of space and program activity difficult and perhaps impossible. It undoubtedly would result in a marked diminution of effectiveness and efficiency in meeting the objectives of the HRF Act.

D. Distribution and Recipient Data

1. Not Applicable

2. Who gets how much?

Recipient groups of HRF awards are indicated on Tables 1 through 5.

3. Geographical Areas of Program Impact

a. Urban or rural?

The recipients of HRF awards are generally those institutions conducting health-related research on a large scale, such as medical schools, hospitals, etc., and consequently are essentially urban.

b. Region of United States

Table 5 indicates the geographical distribution of HRF awards.

4. Not applicable

5. Comparison of Total Federal, State and Local Efforts with Past Efforts in the United States

Prior to 1956, the biomedical research community was forced to finance all health-research facility construction alone. As a result of long years of neglect and overuse during the war period, the physical plant deteriorated to a state where numerous inadequacies confronted the community: insufficient research space to meet the expanding research effort, obsolete space, overcrowded space, underpowered space, etc. Not until 1956, when the HRF program began, did relief come into view. Since 1956, the HRF program participated in nearly two-thirds of all research facility construction. The HRF survey indicates a continuing need for the Federal support in order to meet the expected facility needs over the next 12 years.

II. Budget Information

A. FY 1968-1970 Financial Data

	1968	1969	1970
	(millions of dollars)		
Authorized	145	195	20
Appropriated	35	8.4	--
Obligated	39.4	21.3	--

B. Budget History FY 1968-1970

	1968	1969	1970
	(Millions of dollars)		
Division Recommendation	145	195	20
NIH Recommendation	165	100	20
Department Recommendation	100	50	20
President's Budget	35	8.4	0
Appropriation	35	8.4	0

III. Legislative Changes (Recent)

One title of the Health Manpower Act of 1968 (PL 90-490) extended the HRF program for two years and authorized appropriations of $20 million for FY-1970 and $30 million for FY-1971. (The authorization level for FY 1967-69 was $280 million, but appropriations totaled only $93.4 million. At the hearings on the Health Manpower Act, the authorization levels requested by the Executive Branch were $35 million for FY 1970 and $50 million for FY 1971.)

Two substantive changes were incorporated in the legislation: (1) The Health Professions Education Assistance Program was amended to authorize, starting in FY 1970, inclusion of necessary research and library facilities in a teaching facilities grant; and (2) the Secretary was authorized to use up to 25% of the HRF appropriation for projects which he designates as having special national or regional significance; grants may be made to cover up to 66 2/3% of the cost of construction of such facilities.

Heretofore (between 1963 and 1969) the cost of research facilities for new health professional schools and for existing schools expanding their student enrollment has been borne by the HRF program. After July 1, 1969, this will be assumed by the teaching facilities program.

The second change was made to facilitate construction of facilities for such targeted programs as population control, environmental health research, etc. Obviously, without an appropriation in FY 1970, this authority cannot be exercised.

IV. Forward plan

A. National Goals, Needs, and Program Objectives

If dollar constraints are not considered, the national goal for the Health Research Facilities Construction Program should be to provide the support needed to construct adequate physical facilities to accommodate properly all of the research and research training in the sciences related to health being conducted in the country's non-Federal non-profit institutions in 1980. To accommodate current programs properly, the total inventory of health research space would have to be expanded by 14.8 million net square feet (35% of the inventory) to eliminate over-crowding and about 25% of the space currently being used would have to be replaced or remodeled. By 1980, according to the recent Carnegie Commission report on higher education, graduate enrollment should double. HR space also should approximately double to keep pace with this growth requirement. The aggregate needs include space for especially high priority programs (e.g., institutes devoted to research on such things as population problems, environmental health science, pharmacology-toxicology, etc.), space for expansion of graduate education in the health sciences, remodelling and replacement of sub-standard space, elimination of over-crowding, space to expand existing research programs and to take advantage of new research opportunities and personnel.

Obviously, this goal for research space assumes that Federal support for research and research training in the sciences related to health will grow at a concomitant rate. The capability of the biomedical research community to expand at this rate certainly exists. The only inhibitor would be Federal funds. The Realistic Level assumes that such funds would be provided.

It should be noted that on the average there is a three-year lag between the commitment of funds for construction of facilities and the actual availability of facilities. This three-year lag is assumed throughout the discussion below. Thus, in order to achieve the 1980 space goal, all of the funds would have to have been committed by 1977.

The estimates of requirements for new space and remodelling are from the findings of the recently completed national survey of Health Research Facilities conducted by a professional survey research firm under contract with NIH. The report of this survey is attached for reference.

B. Program Requirements

1. Realistic objectives

The requirements for additional space needed to achieve the realistic objectives for 1980 are set forth in Table IV B.1. The following assumptions were used in developing this table:

(a) The 1980 goal is to have 96 million net square feet of health research facilities space available in satisfactory condition. This is the amount that the respondents to the HRF survey estimated they will require. It is roughly compatible with the estimated growth in graduate education that the Carnegie Commission suggests be accepted as a national goal. This goal assumes an aggregate growth rate of facilities which is the same as the growth rate of the national HR space inventory between 1957 and 1968--8.5% per year compounded. If the requirements for eliminating the backlog of overcrowding and substandard space is not considered, the growth rate would be 6.5% per year compunded.

(b) The Health Professions Education Assistance Act will be able to provide 7.5 million net square feet of this requirement in the period Fiscal Year 1970-1977. This assumes that funds for constructing 500 new first-year medical school places will be committed in Fiscal Year 1970, and funds for construction of 1000 first-year places will be committed each year in Fiscal Years 1971-77. It further assumes that about 1000 net square feet of research space per first-year medical student will be included in each teaching facility grant to a new or expanding medical school. (The current national average is 1860 net square feet per first-year medical student.)

(c) The Federal Government will be responsible for assisting in the funding of 60% of the new construction required, with the other 40% being funded entirely from non-Federal sources. This is the same relationship that has existed since the inception of the HRF program in 1957. The survey respondents indicated their doubts that this proportion of non-Federal funding would be available for meeting their 1980 requirements: they expect non-Federal funding to drop from 69% to 42%. However, for purposes of this projection, the assumption was made that the same pattern of funding responsibility would obtain in the future as has obtained in the past.

(d) Only 1/3 of the space remodeled between 1957 and 1968 received Federal support--the other 2/3 was remodeled entirely without Federal assistance. In projecting the requirements for 1980, the assumption is made that this ratio would continue to obtain.

(e) The matching ratio of 50-50 for health research facilities grants is assumed to remain constant. No effort was made in these projections to assess the financial impact of the new authority in Section 706(a)(2) of Title VII A to use up to 25% of the HRF appropriation for projects designated by the Secretary as being of special National significance. Such project can receive HRF grants to cover up to 66 2/3% of their cost.

(f) The national inventory in 1971 is assumed to be about 8.6 million net square feet larger than the amount available in 1968. That is the amount which was estimated to be in the construction pipe-line at the time of the survey in 1968. It is assumed to be available by 1971.

2. Alternative objectives

Table IV B.2 contains the program plan developed on the assumption that the level of research and research training activity obtaining in 1970 remains constant throughout the period and the objective of the Health Research Facilities program is to maintain the satisfactory quality of the space and to eliminate current (1969) overcrowding. The following assumptions were used in developing this table:

(a) To maintain the quality of the space will require remodelling of 6 1/2 million net square feet, which is in the current backlog of space requiring remodelling, plus an additional 1 million net square feet of space per year in 1971 and 1972, 1.1 million net square feet per year in 1973 and 1974, and 1.2 million net square feet in 1975. These estimates are based on the remodelling frequency data contained in the HRF survey.

(b) One-third of the space being remodelled should receive Federal assistance through the Health Research Facilities program, with the balance to be funded entirely from non-Federal sources as has been the pattern heretofore.

(c) The survey reported that 3.7 million net square feet of space is currently in such unsatisfactory condition that it should be replaced. In addition, 14.8 million net square feet more space is needed to eliminate overcrowding. Since 8.6 million net square feet was in the construction pipe-line at the time the survey was made, it is assumed that 9.9 million net square feet, or 2 million per year, should be funded and committed for construction in each year from FY 1971 through 1975.

(d) Federal funds should assist in constructing 60% of this amount; 40% will be built without Federal assistance.

(e) About 0.5 million net square feet per year of research space will be built by the Health Professions Educations Assistance program under its teaching facility grants to medical schools.

C. Budget projection

1. Using present administrative and legislative structure

The dollar requirements are shown on Tables IV B.1 and B.2 for the Realistic Level and the Alternate Level, respectively. In calculating these requirements, the cost of new construction was assumed to be \$80 per nsf in 1972, \$90 per nsf in 1973, \$95 per nsf in 1974 and \$100 per nsf in 1975. The cost of remodelling was assumed to be 50% of the cost of new construction. Both estimates assume continuation of the present administrative and legislative structure. The HRF funds required for the Realistic Level increase from \$116 million in Fiscal Year 1971 to \$150 million in FY 1975. On the Alternate Level, the FY 1971 HRF requirement is \$44 million rising gradually to \$58 million in FY 1975.

The consultants on the Team point out that non-Federal funds for construction are already very scarce and will become scarcer. Although different situations obtain for state-supported schools in wealthy states, on the one hand, and those situated in poorer states where the tax base is already severely strained, on the other, even in the wealthy states matching money is becoming much more difficult to obtain. In the case of private schools, many of the less affluent are verging on the brink of financial crisis, and to assume their ability to obtain non-Federal funds in the same proportion that they were able to do in the past is quite unrealistic.

If the ratio of non-Federal to Federal funding were to shift, from the roughly 30% Federal funding for new construction to about 60% (which would bring it more in line with the survey respondents estimate of requirements) this might be a more realistic estimate. Such a shift would occur if, for example, the matching ratio were changed from 50-50 to 66 2/3% Federal to 33 1/3% non-Federal (as is true for Health Professions Education Assistance Construction) and 90% of the facilities were constructed with Federal assistance. In that case, the HRF dollar requirements shown in Tables IV. B.1 and IV. B.2 would double.

2. Alternative methods for meeting needs

One possible alternative way of meeting the needs for health research facilities is through a Federally guaranteed loan program with amortization and interest for carrying the loans to be obtained from Federal research and training or institutional support grants. However, there is a big difference in this situation from that obtaining for a loan scheme for financing hospital construction by including interest and amortization charges for facilities in the patient per diem costs to be paid by third party insurers. In the latter case, the source of facilities financing is clearly predictable. In the former--subject as it is to the vagaries of the granting process, and fluctuations in Federal budgets--it is not. Sharp fluctuations downward in research budget levels--as has occurred in the past year--could precipitate a real crisis and force some institutions to default on loan payments. Considering the ever-increasing financial pressures facing all academic institutions, a loan program--whether direct Federal loans or Federal guarantees of private loans, with or without interest subsidies--does not appear to be practical or desirable from the viewpoints either of the Federal Government or the institutions unless there are basic changes in Federal policy for support of the institutions which would make such a loan program feasible.

Another possibility for meeting the needs of programs of special national significance is to authorize such programs separately. This was done a few years ago for research facilities for mental retardation. A similar proposal was submitted to the Department by NIH last year for Population Research Centers. This certainly has some merit in that it clearly guarantees that funds are used for a particular purpose. The need for this type of earmarking is currently recognized in the Health Research Facilities authorizing legislation. Section 706(a)(2) authorizes the Secretary of HEW to earmark up to 25% of the HRF appropriation for FY 1970 and FY 1971 for projects of special national or regional significance and to make grants to cover up to 66 2/3 percent of the cost of construction of such facilities.

However, earmarking funds for special programs-either through special legislative authority or through use of existing authority--cannot deal with more than a small portion of the overall needs for health research facilities.

D. Legislation requirements

Both the Realistic and Alternate levels require legislation in 1970. The present authorization for the HRF program extends through FY 1971. The FY 1971 authorization level is $30 million.

Accordingly, the legislation must be extended through 1975 to accommodate either level, and both plans require amendment of the current authorization level for FY 1971. Specifically, the 1971 authorization level should be changed from $30 million to $120 million for the Realistic Level with the figures for 1972-73 and 74 and 1975 being $130 million, $140 million, $150 million and $160 million, respectively. For the Alternate Level, the figures should be $45 million for FY 1971, $50 million for FY 1972, $50 million for $1973, $50 million for FY 1974 and $60 million for FY 1975.

If the matching ratio were to be changed to 2 Federal to 1 non-Federal dollars, this would also require a change in the legislation and the authorization ceilings (as discussed in paragraph C above) would have to be double those mentioned in the previous paragraph.

TABLE IV B.1 Realistic Level - Program Plan to Meet 1980 HRF Requirements

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Total HR Space to be available (millions of nsf)	50.05	51.9	54.4	60.3	60.2	72.1	78.0	84.0	90.0	96.0
New space completed (total) (millions of nsf)	2.6	1.9	2.5	5.9	5.9	5.9	5.9	6.0	6.0	6.0
Federally-assisted	1.2	0.4	0.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
by HPEA	(0)	(0)	(0.5)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)
by HRF	(1.2)	(0.4)	(0)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)
Without Federal assistance	1.4	1.5	2.0	2.3	2.3	2.3	2.3	2.3	2.3	2.3
New space to be built with NIH awards (millions of nsf)	3.6	3.6	3.6	3.6	3.7	3.7	3.7	----	----	----
by HPEA	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)			
by HRF	(2.6)	(2.6)	(2.6)	(2.6)	(2.7)	(2.7)	(2.7)			
Space to be remodelled with awards made	2.4	2.4	2.5	2.5	2.5	2.5	2.5	----	----	----
Federally-assisted	(0.8)	(0.8)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)			
without Federal assistance	(1.6)	(1.6)	(1.5)	(1.5)	(1.5)	(1.5)	(1.5)			
HRF Funds required (millions of dollars)	120	127	141	148	160	168	177	----	----	----
For new construction	(104)	(110)	(118)	(124)	(135)	(142)	(149)			
For remodelling	(16)	(17)	(23)	(24)	(25)	(26)	(28)			

TBLE IV B.2 Alternative Level - Program Plan to Maintain Output at Constant FY-1970 Level)

	1971	1972	1973	1974	1975
Rmodelling requirements (total)	2.3	2.3	2.4	2.4	2.5
HRF-assisted	(0.8)	(0.8)	(0.8)	(0.8)	(0.9)
Without HRF assistance	(1.5)	(1.5)	(1.6)	(1.6)	(1.6)
(illions of net square feet)					
Nw space requirements (total)	2.0	2.0	2.0	2.0	2.0
HRF-assisted	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)
HPEA-assisted	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)
No Federal assistance	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)
(illions of net square feet)					
HF funds required (millions of dollars)	44	47	50	52	58
New construction	(28)	(30)	(32)	(33)	(35)
Remodelling	(16)	(17)	(18)	(19)	(23)

Resolution Passed on March 27, 1969
by the
National Advisory Council on Health Research Facilities

The National Advisory Council on Health Research Facilities is charged with the responsibility of advising the National Institutes of Health on the needs of the Nation for facilities to house programs of health-related research. In response to this charge, the Council feels compelled to express its deep concern about the present trend toward decreased Federal support for this essential activity in our society.

Since its inception in 1957, the NIH, through the HRF Program, has participated in the cost of more than one-half of the new health-related research space constructed. This space was an essential component of the efforts that have brought into being medical research programs which have made the United States a world leader in this sphere of human activity. The practical consequences of this research have included such advances in the diagnosis and treatment of disease as electronic devices for the control of heart attacks, chronic dialysis for kidney failure, kidney transplantation, open heart surgery, drug therapy for leukemia, Hodgkins disease and some kinds of cancer, the almost complete prevention of polio, measles and other infectious diseases, etc. As a result of these advances, millions of our citizens enjoy longer, more productive and more self-fulfilling lives.

Despite this record of high achievement, worthy of a great and civilized nation, Federal support for construction of health-research laboratories has decreased steadily during the past several years. The level of support has been less than one-half that recommended by the Congress. For fiscal year 1970, the President's budget contains no support whatsoever for this function. What are the origins of this turn of events which, in the opinion of this Council, portends a national disaster?

The emergency of this trend is related to the development of increased awareness of serious problems in the delivery of health services to our population. This awareness has led to growing public demand for greater Federal support of the health care system. The argument has been advanced that past and present failures to provide adequate Federal funding of delivery of health care <u>are due to</u> excessive NIH support of medical research. The Council considers this argument to be inconsistent with the facts, unreasonable, and unwarranted. Health care and research are co-operative, not competitive endeavors.

First, the magnitude of the Federal health research budget is only about 2% of the cost of delivery of health care. Therefore, transfer of all funds now spent on research in support of health services would produce only a negligible change in the total budget available for the latter function. Second, substantial improvements in the delivery of health care will involve economic and social factors, e.g., rewards for health personnel working with the poor, which transcend the issue of Federal support for health research. Finally, in our view, future advances in the diagnosis and treatment of disease are directly dependent on the productivity of current basic research. For example, further progress in organ transplantation requires greater understanding of the immunology of tissue antigens. The prevention and cure of cancer, as well as certain developmental disorders, depends on new insights into the molecular basis of differentiation. Progress in the treatment of diseases like glomerulonephritis and rheumatoid arthritis demands fresh knowledge of auto-immune reactions. Control of heart attack and stroke must await understanding of the abnormalities in fat metabolism which underlie arteriosclerosis. Management of schizophrenia and other major mental diseases will benefit from an improved grasp of the biochemistry and physiology of the brain.

This Council believes that an important cuase of the present confusion about support of health-related research depends on a misunderstanding by the lay public of the relation between basic research and technological progress. It is certainly not possible to anticipate the time table or precise form of the practical benefits of basic research. However, it is equally certain that no such progress will occur without the hard intellectual labor of fundamental research. After all, mankind has transformed this planet in the past 400 years because of the free play of the human mind expressed in experiment.

In the light of these convictions, the Council urges that every effort be made to restore and maintain NIH support for the facilities essential to health research. Without such support, our laboratories will become obsolete and without the laboratories our scientists cannot pursue the investigations which will permit the development of artificial organs, the cure of cancer or the

prevention of heart disease and stroke. The effects of failure to restore such support will be felt, not tomorrow by ourselves, but in ten years by our children, and in 30 years by our children's children.

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